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MODEL AIRPLANE

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July 1988

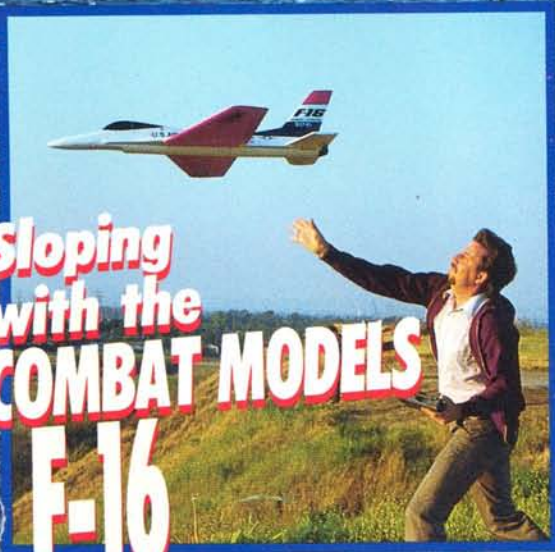
THE WORLD'S PREMIER R/C MODELING MAGAZINE

SUPER SPORTSTER 120 Review

HOW TO: Electric Motor Mount

Four-Cycle Show Coverage

Color CORSAIR Chronology



Sloping with the COMBAT MODELS F-16

Golden Age Racers

Construction: SKYDART— The Ultimate R/C Paper Plane?

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MODEL AIRPLANE NEWS

ON THE COVER: Somewhere in the South Pacific, a solitary F4U whistles along; just feet above the sea, its land-based model counterpart by Mike Lee; and John Lupperger puts his "all" into launching the F-16 Slope Soarer. Orbiting on the upper half of the page is Gary Emerson's magnificent PBY Catalina, and the Great Planes Super Sportster 90/120, built by Dick Purdy.

FEATURES

CONSTRUCTION

COLUMNS

COLUMNS

DEPARTMENTS

Model Airplane News (ISSN 0026-7295) is published monthly by **Air Age, Inc.**, 251 Danbury Rd., Wilton, CT 06897. Second class postage paid at Wilton, Connecticut, and at additional mailing offices. Subscription rates are $25 for 1 year (foreign $33), $47 for 2 years (foreign $63), $65 for three years (foreign $89). **Postmaster:** Send Form 3579 to **Model Airplane News,** P.O. Box 428, Mount Morris, IL 61054.

Editorial

by RICH URAVITCH

NEXT MONTH'S *MAN* is a helicopter special issue with multiple product reviews, a mini buyer's guide and full-scale chopper coverage. When we first considered the idea, it sounded great, but my hands-on involvement with R/C helicopters was limited to reading about them. I had watched them operate, but never really paid them a lot of attention. I found their capabilities fascinating, but figured that they were yet another exciting avenue of R/Cing to explore... sometime! (Along with many, many others!)

Responding to the frequent prodding of the Helo Honchos like Messrs. Farkas, Hath, Tradelius and others, I decided to try one to convey my impressions to others who, like me, were rank beginners to rotary wing operations. I'll tell you all about it next month; the issue looks great!

• Safety Reminder: With the ranks of R/Cers growing, especially through the infusion of car and boat modelers, some of our safety procedures may need reinforcing. Since we're in a frequency-transition period leading to the 1991 requirements (and, frankly, may have become less than vigilant), we're printing this letter from Bruce Walters of Sacramento, CA, as a sobering reminder:

"How does the idea of a Zenoah-powered, 13-pound R/C biplane heading straight for your chest sound? That was the situation I was faced with last weekend at the local R/C field.

"While I was guiding my plane out of the pit area, I looked up and saw the six-foot biplane rotate from takeoff and beeline for my position. Instinctively, I hit the deck and heard a crash just behind me as the craft collided with the pit area safety fence. The impact point, about four feet above the ground, left a good-size dent in the chain-link fence. A bit scraped and very shaken, I stood up to find a crowd quickly gathering. The local expert was there, along with the biplane pilot, and he provided a quick explanation:

"'He wasn't in the right pilot station; you were,' he said. The expert further explained that the biplane pilot was at the other end of the flight line when he should have been *next* to me. As the biplane took off, it approached my transmitter, and the interference sent it out of control. '3IM,' the expert called it. I don't understand the specifics, but I know what it can do!

"I don't tell this story to be sensational. If I hadn't noticed the biplane and ducked, the plane would have seriously injured or killed me! *Learn the frequency-control procedures at your local flying field and USE THEM!* It could save not only your airplane, but someone's life!"

• Reader Reports: Here's a list of some of the Field and Bench product reviews currently in the works:

Bob Parkinson Regal Eagle
Hobby Shack Loadstar
UMP Bipe MK.II
Sig Seniorita
Midwest Aerostar 20
TF Headmaster 40 ARF
Dynaflite Fun-Scale Mustang .60
Aristo-Craft J-3 Cub
Duracraft Duraplane
Bob Parkinson Blue Hornet
CGM Vector
Byron Originals Bullet
Ace 120-4 Bipe
Sig Spacewalker
Yellow Aircraft A-4 Skyhawk
Ace Seamaster 40
EZ PT-19 and Dago Red P-51

Past issues tell you how to participate in this important element of our product reviews. Tell us what you thought of the product, send us some photos and receive a free subscription for your efforts. ■

MODEL AIRPLANE NEWS

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U.S. & Possessions (including APO & FPO): 1 year $25.00; 2 years $47.00; 3 years $65.00. Outside U.S.: 1 year $33.00; 2 years $63.00; 3 years $89.00. Payment must be in U.S. funds.

MODEL AIRPLANE NEWS is published monthly by Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. Connecticut Editorial and Business Offices, 251 Danbury Rd., Wilton, CT 06897, phone 203-834-2900. Y.P. Johnson, President; G.E. DeFrancesco, Vice President; L.V. DeFrancesco, Secretary; Y.M. Micik, Treasurer. Second Class Postage paid at Wilton, Connecticut, and additional Mailing Office.

ISSN No. 0026-7295.

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Airwaves

Old-Timer

In the April '88 issue of *Model Airplane News*, you have an article on "How To Build a Tri-Motor Ford Monoplane Model," and you have three miniature plans of the model.

I would like to purchase these plans, but there's no mention of the plans being available, and I would appreciate any information on this.

I believe it's an "Ideal" model that I built in the '20s; I'm 75 years old and still building models.

Dezso Evans
Centerville, OH

Mr. Evans, the plans we ran in reduced form in the April issue were reprinted from the first *issue of* Model Airplane News, *back in 1929. Even our office veteran, Chris Chianelli, wasn't sure whether they represented an original design or, as you mentioned, were from the "Ideal" model kit. If Chris doesn't know, no one here does! In any event, the full-size plan run was originally a standard-page size and probably wouldn't be of much help to you.*

Thanks very much for your letter. I hope you'll continue modeling and reading Model Airplane News. RAU

Electric Helicopter

I'm interested in a remote-control helicopter, but I don't like gas engines and the price of gas helicopters. Would you please tell me if there is a company that makes R/C electric helicopters? Would you also send me any pictures or information on these helicopters, or just the address of the company, so I can write to them. If there isn't a company making this type of product, please let me know, so I don't think you're ignoring my letter.

Richard C. King
Northville, MI

Richard, I hope this convinces you that we don't ignore our readers. We know of two electric R/C helicopters. One is being developed by Hyatt-Tech Advanced R/C (45 Marchwood Rd., Exton, PA 19341) and might be available when you read this. The other is from Japan, is a Jet Ranger and, as far as I know, is not imported... yet!! Next month's issue may just convince you that there's a future for gas-powered choppers. RAU

Scale-Model Search

I'm 18 years old and I'm in great need of your wealth of information, as I have a problem which you might be able to solve or help me with. The problem is, my Dad and I own a 1946 Luscombe 8A, and both of us would like to build a scale R/C model of it, but we've been unable to find a plan or a kit. This is my last chance. I love your magazine and know we have a place to turn to for the best info. Keep it up!

Dwayne Long
14 Durward St.,
Winnipeg, Manitoba, Canada
R2V-3P6

Dwayne, glad you enjoy MAN. *The Luscombe would certainly make a great R/C model, especially if done in the larger scales. Unfortunately, I know of no source for plans or a kit, although I seem to remember a good set of three-views done by J.M. Triggs a long while back.*

Can anyone out there help Dwayne and his dad? RAU

Looking for Lockheed

I've been looking for a model of a Lockheed Vega. I haven't been able to find one, nor have I been able to find any drawings of it. Do you know of someone

(Continued on page 10)

who has a model or drawings that I could purchase? Do you know if Lockheed could help and, if yes, who do I contact?

Steve Crenshaw
P.O. Box 780326
Wichita, KS 67278-0326

Steve, while I don't know of anyone specific at Lockheed who might be able to help, we have the William Nye four-sheet set of scale drawings of the Vega that should fit your requirements. The set is $10, plus postage, and is among the many to be found in our plans directory. We're printing your entire address, figuring that other modelers might be of assistance
RAU

Frequencies

I'm interested in operating remote-control models when I return to the United States. What frequencies are authorized for use of remote-control cars, boats, airplanes and helicopters?

James Krashin
APO, NY

Jim, we look forward to your return to the land of the round doorknob. The following list defines the channel numbers and frequencies approved by the FCC as of January '88.
RAU

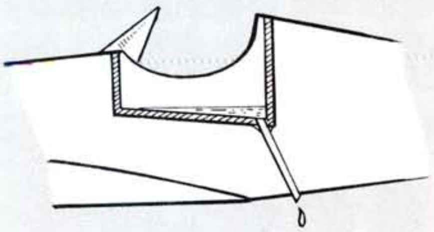
For Aircraft Only		For Surface Use Only (Cars and Boats)	
Channel 12	72.030	Channel 62	75.430
Channel 14	72.070	Channel 64	75.470
Channel 16	72.110	Channel 66	75.510
Channel 18	72.150	Channel 68	75.550
Channel 20	72.190	Channel 70	75.590
Channel 22	72.230	Channel 72	75.630
Channel 24	72.270	Channel 74	75.670
Channel 26	72.310	Channel 76	75.510
Channel 28	72.350	Channel 78	75.750
Channel 30	72.390	Channel 80	75.590
Channel 32	72.430	Channel 82	75.830
Channel 34	72.470	Channel 84	75.870
Channel 38	72.550	Channel 86	75.910
Channel 40	72.590	Channel 88	75.950
Channel 42	72.630	Channel 90	75.990
Channel 44	72.670		
Channel 46	72.710		
Channel 48	72.750		
Channel 50	72.790		
Channel 52	72.830		
Channel 54	72.870		
Channel 56	72.910		

Channels 36 and 58 will not be used. It is illegal to operate transmitters on 72.080, 72.240, 72.400, 72.960, 72.160, 72.320 and 75.640. These are known as the "old" frequencies.

We welcome your comments, opinions, and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News**, 251 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and length.

Hints & Kinks

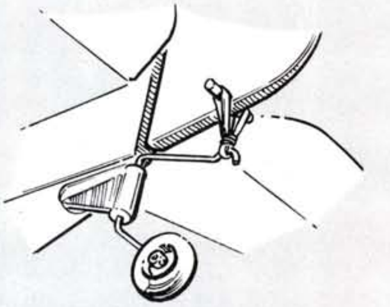
by JIM NEWMAN



SELF-DRAINING COCKPIT

In England, where they get four seasons in a day, an open cockpit might fill with water in a sudden shower. A similar risk exists from floatplane spray. To minimize that possibility, install a floor with a drinking-straw drain at the lowest point; then be sure to thoroughly waterproof the area with epoxy or urethane varnish. For a floatplane, it's important to cut the lower end of the straw at an angle facing rearwards as shown.

Lloyd Ressler, Gerrards Cross, Bucks., England



SERVO GEAR SAVER

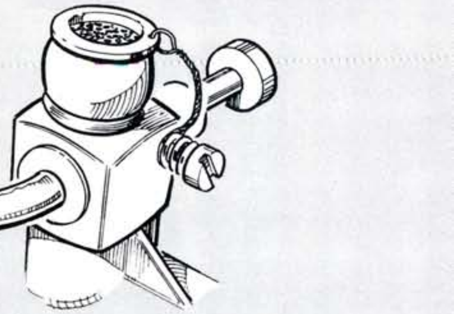
Taxiing over rough ground imposes severe shocks on the rudder servo gears. To soften the impact, our contributor evolved this scheme of gluing a dowel across the bottom of the rudder, then looping a rubber band lightly over the dowel and around the tailwheel tiller arm—the rubber band now acting as a very effective shock absorber. Any "full-size" pilot who has ever taxied an airplane with a rigid connection to the tailwheel (e.g., a Monerai), knows **exactly** what a rudder servo suffers!

Gerard Benoit, Agawam, MA

DISPOSABLE EPOXY PALETTES

Don't throw away that phone book! Saw it into handy-size pads on which to mix epoxy. As each page is used, tear if off to expose a clean one.

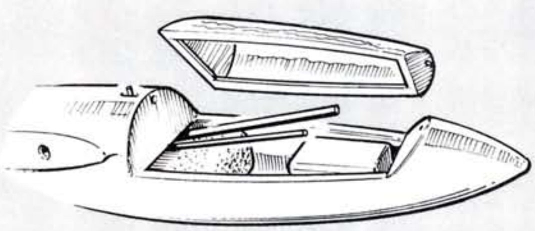
Denis Jonson, Wheaton, IL



CAPTIVE AIR FILTER

This modeler lost a couple of valuable air filters; they popped off in nose-over landings. To eliminate the constant expense of replacements, he pierced a hole in the lip of the rubber cap, then twisted fine copper wire through it and around the idle screw. Now it pops off, but stays with the ship.

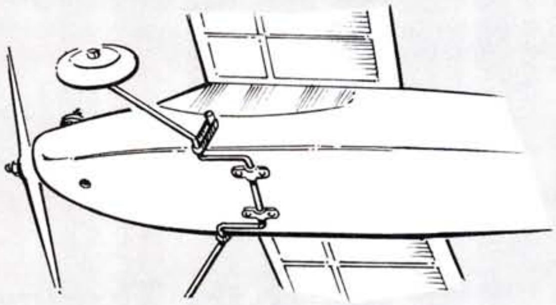
Gary Truelove, Alamagordo, NM



WING-ROD STOWAGE

Having arrived at the glider field without the wing joiner rods a couple of times, our contributor now stows them in the cockpit under the canopy after de-rigging the wings. In that way, the rods now go wherever the glider goes!

Ray Juschkus, New Hyde Park, NY



SHOCK-ABSORBING LANDING GEAR

Having wiped out the gear-mounting bulkhead in rough ground landings, I needed a solution to the problem. The gear wire is held in a slot by regular landing-gear straps, then rubber bands are stretched—not too tightly—around the wires and over the dowels. On impact, the gear swings back, restrained by the bands. The gear can also be swung **all** the way back and upwards to allow belly landings in rough fields, and this is a much safer way of doing it. Didn't we mount gears like that on free-flight ships, once upon a time?

R.C. Armbruster, Mountville, OH

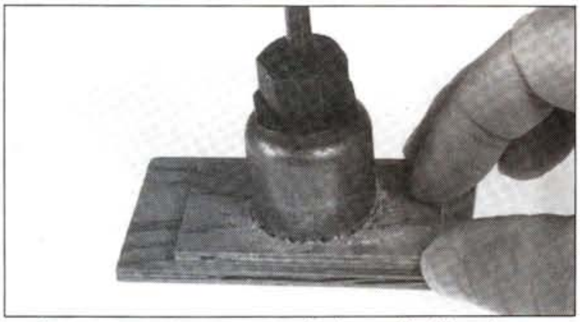
Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o **Model Airplane News,** 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

How To:

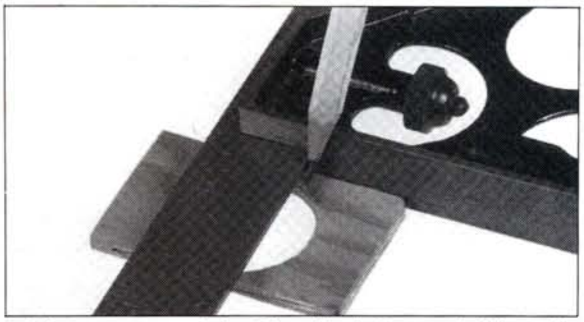
by RANDY RANDOLPH

ELECTRIC MOTOR MOUNT

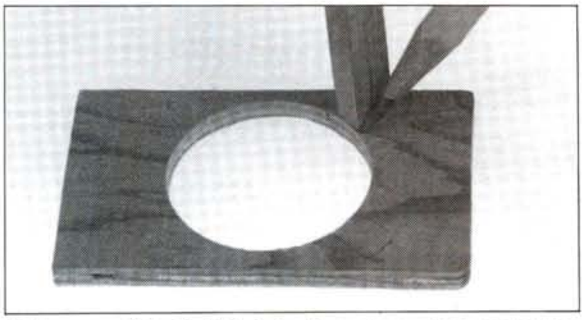
We often refer to the device that holds the engine on the front of an airplane as a "motor mount" even though we all know that the term "motor" refers to something powered by electricity. The pictures show how to make a motor mount from 1/8-inch plywood and 1/4x3/8-inch hardwood strips. It's a firm mount with plenty of ventilation as well as the flexibility necessary to prevent shaft damage to the motor on hard landings.



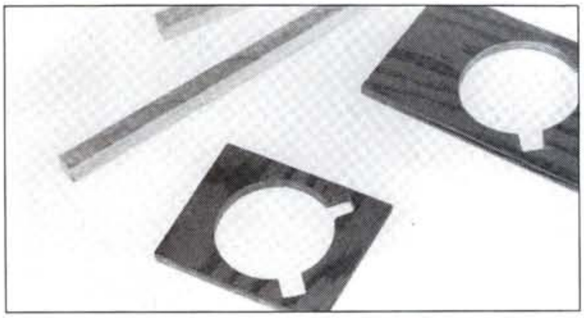
1. The mount requires two 1/8-inch plywood bulkheads separated by about 4 inches. Use the side view of the plans to locate the thrust line on both. Place them together in the proper relationship and drill both at the same time with a 1½-inch hole saw.



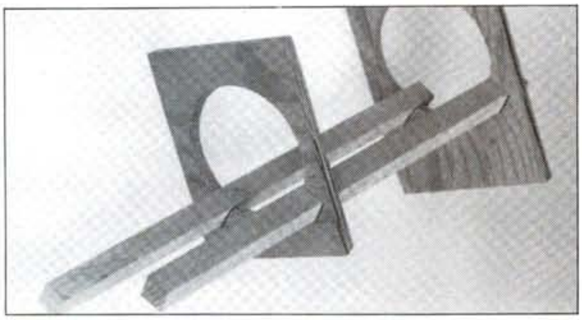
2. Using a square, mark the sides of the holes ½ an inch from the bottom. These marks designate one-third of the diameter of the holes, and the marks must be in the same location on both sides of each hole on both bulkheads.



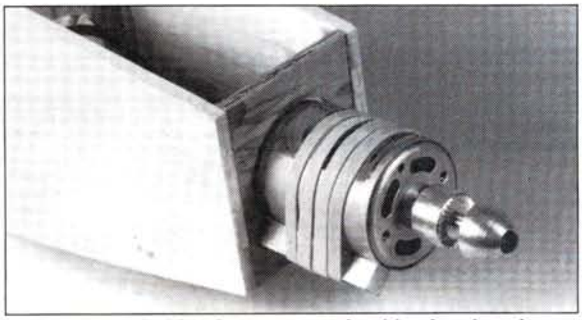
3. Use one of the 1/4x3/8-inch hardwood mounts as a template, hold it flush with the inside of the hole and mark its location on the bulkheads. Locate the outside edge of the mount at the one-third diameter marks on the edge of the holes.



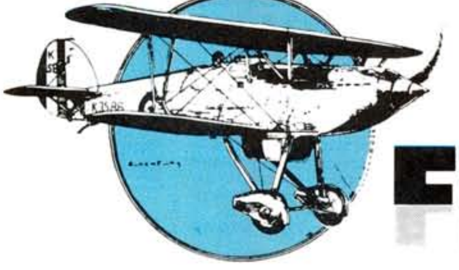
4. Saw the marked notches in both bulkheads. The hardwood mounts should be a fairly tight fit in the notches, so saw the notches slightly too small and then enlarge them as necessary with a modeler's knife and sandpaper.



5. The assembled mount as it will appear on the airplane. The hardwood strips are mounted and glued at this angle, so they match the sides of the motor as well as resist the tendency for the motor to push them apart.



6. The motor is held in the mounts with rubber bands and it can be moved back and forth in the mount to achieve the proper balance point for the airplane. Air can pass over and through the motor, through the fuselage and over the motor battery pack for good cooling.



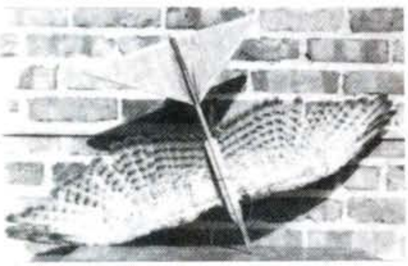
Fifty Years Ago...

by STEVE POND

IN JULY 1938, you could get a subscription to *Model Airplane News* for a dollar; a Brown Jr., Ohlsson Pacemaker or Baby Cyclone model engine for ten dollars; or just about any gas airplane kit on the market for five to 15 dollars.

Just as these prices are fond memories, so the aircraft introduced in the July '38 issue of *Model Airplane News* have a place in the aviation buff's memory banks.

Then new to the world of full-scale aviation were the Aeronca K sportplane, the Luscombe 8 with an all-new metal frame and the twin-engine Beechcraft Hydro seaplane. New for the military were the Douglas TDG-1 Torpedo plane and the Consolidated XPB2Y-1 flying boat with retractable wing-tip floats. Although the Boeing B-15 bomber wasn't a *new* aircraft, it was being tested at the Army's experimental laboratory at Wright Field in Dayton, OH.



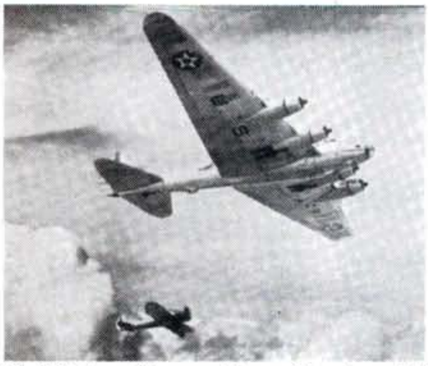
The hawk-winged glider was inferior to the old balsa wing.

Previously, aircraft manufacturers all over the world had been reaching for the stratosphere—trying to fly ever higher. Now it seemed as though they were trying to span the horizon with the largest, most powerful airships. The B-15 bomber—referred to as the "flying dreadnought" (heavily armed ship)—was the largest ship of its time. The B-15 is approximately 90 feet long, has a wingspan of 150 feet (similar to that of a modern Boeing 767) and is powered by four 1,000hp Pratt and Whitney twin-row Wasp Senior engines. Located inside the aircraft are two auxiliary engines driving two 110V AC generators through over seven miles of wiring to power the electrical devices on the craft. Also in the race for the biggest were the French, with the Potez 41 bomber, and the Russians, with the N-213 and N-169 bombers. Maj. Alexander De Seversky (founder of Seversky Aircraft, the precursor to Republic Aviation) had even entertained the idea of building a double-hulled flying

Although there were a number of these Beeches around, this is one of only a few to ever see a pair of floats.

boat for use as a passenger carrier. It was reported that the wingspan would be a whopping 250 feet (two Boeing 757s side by side), and it would have a gross weight of 300,000 pounds! Accommodations would be provided for 120 persons, there would be a bath in each stateroom and also a dining salon, which would seat 50 at one sitting. Think you've heard it all? There were to be promenade decks in the leading edges of the wings and also a cocktail lounge!

Model aviation continued as it had done for years with gliders, rubber-powered craft and free flight. One article in the July '38 issue featured an experimental glider that used the wings of a real



The U.S. Armed Forces airborne "dreadnought," the Boeing B-15 Bomber, was the largest in the world, giving Uncle Sam an edge in the bid for aerial supremacy.

hawk. (We hope the bird was already dead.) Using the real wings made the glider very nose-heavy. Even though they move a hawk along at a pretty good clip, on a glider they were inferior to the old balsa wing. New developments for gas-powered fliers were the Falcon and Condor twin-cylinder engines. These had previously been available only in a very limited quantity because they were made by their designers in their own garages, but they would now be available in quantity from Buell Manufacturing of Chicago. To provide hobbyists with a fine model engine at a reasonable cost, Buell purchased the rights to produce these engines from their designers.

An addition to the world of gas-powered modeling was the model boat. Model boats had been around for a short time, but were built only by a few. Now, boat kits (such as the Sea Hornet) and plans for the Phantom Super Streamlined speedboat were available to the masses. The Phantom, which was designed for use with a 15cc engine, had the same attributes as today's boats and was capable of running at 40mph. The one thing missing on these boats is a radio-control system! Much like the free-flight airplanes, these boats relied on metered fuel supplies, a little left rudder and a lot of luck to keep them going in an oval path and away from disaster.

Next month: new developments in radio-control! ■

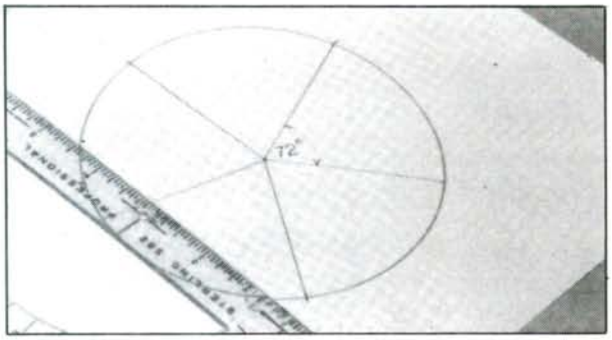
EDITOR'S NOTE: Although Randy Randolph's "How To" articles are usually presented elsewhere in the magazine, I thought that this particular tip would lend itself extremely well to the "Sporty Scale" section. The method can be utilized using film as presented, or may be employed as a means to cutting the masking-paper templates, if you choose to paint your insignias. Either way, it provides the solution for the scale builder.

Sporty Scale Techniques

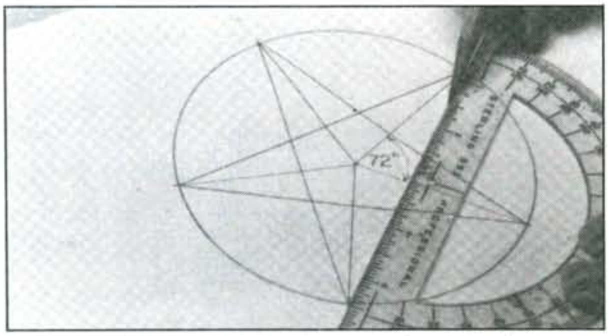
by RANDY RANDOLPH

STAR 'N' BALL INSIGNIA

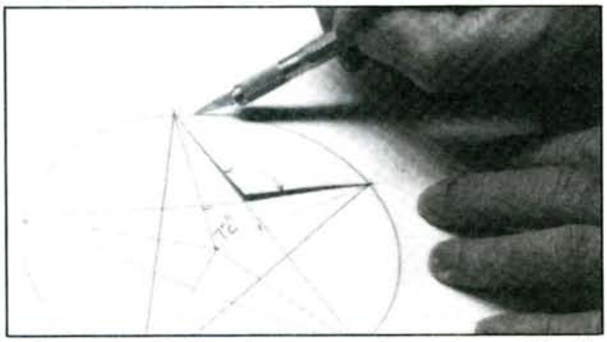
The "between-the wars" period was a rather romantic time in the development of military aircraft; a time when the red, white and blue star-and-ball insignia identified the fighting planes of the US. Later, when war with Japan loomed on the horizon, the ball was deleted and the white star alone became the identifying mark. The photos show how to reproduce this classic design with one of the plastic films.



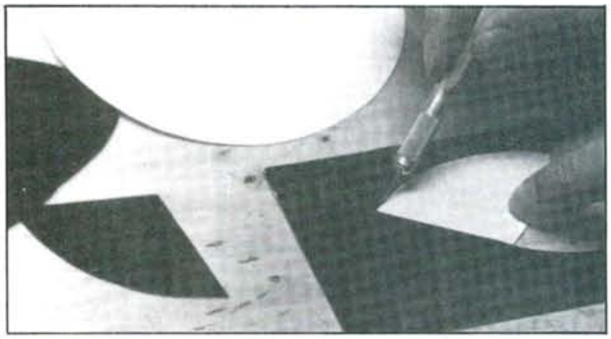
1. A compass, a straightedge and a protractor are the only tools needed. On a piece of paper, use the compass to draw a circle the size of the finished insignia. Next, using the protractor, divide the circle by drawing five radius lines 72 degrees apart from the center to the circumference.



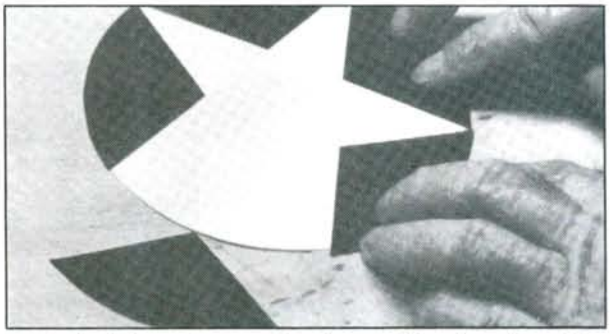
2. Form the star by using a straightedge to draw a line from points where the radius lines and the circumference intersect to points on the opposite sides of the circle.



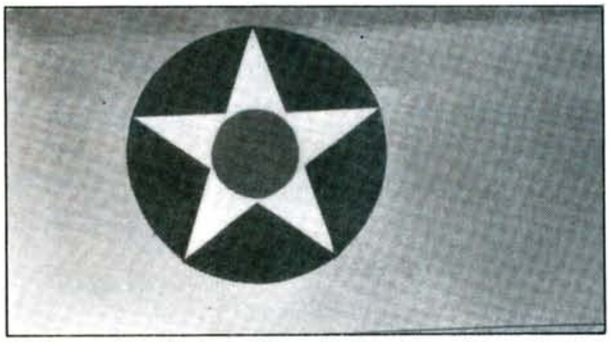
3. Cut out the pie-shaped segments as shown; these will be the templates for the blue areas of the insignia. Although one template is actually enough, cut out all five so that they can be used to simulate the completed design.



4. Use these templates to draw five sectors of blue film. Use the compass to draw a circle of the same size as the first one, and cut it out of white film. Scissors work a little better than a razor knife.



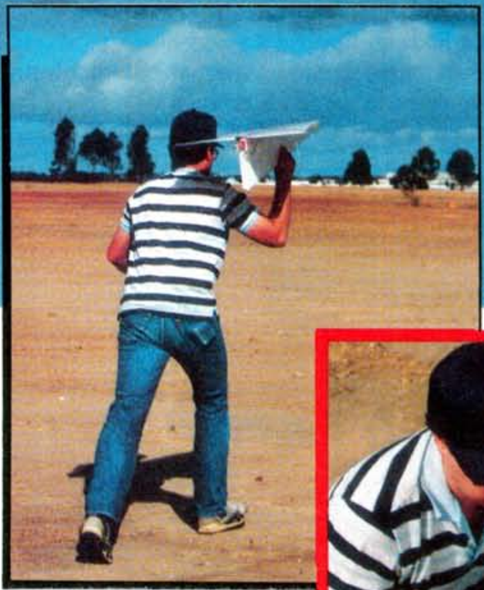
5. The five blue sections are joined around the edge of the white-film circle to form the star. (The white disk is first ironed onto the flying surface, and the blue segments are then added.)



6. The completed insignia. The red ball is cut from film and added last; its diameter is the same length as the sides of the pentagon formed in the center of the star when it was originally drawn.

SKYDART

EVERY SCHOOLBOY'S DREAM... DESIGNED IN DETENTION, BUILT IN STUDY HALL, FLOWN AT RECESS!



The hand-launch sequence shows just how positive the Skydart's climb-out is!

7TH PLACE In the M.A.N. "GREAT R/C DESIGN CONTEST"

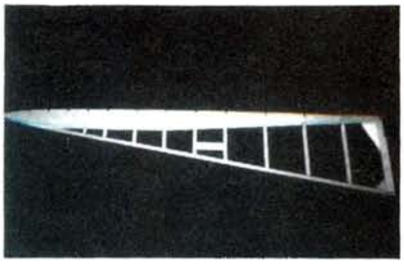
by MARK McCRAY

With the T.D. .051 sounding like some angry hornet, Mark prepares for another flight across the open-air auditorium.

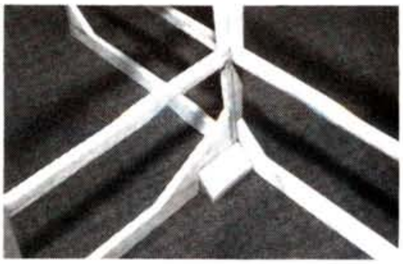
THE SKYDART is a result of my search for an unusual flying subject to model. I thought back to the days of my youth, when building and flying consisted of taking a piece of paper and folding it into a plane. I always thought flight times were a little short! OK, I'll put an engine in it. It would be more fun to fly it rather than watch it... I'll put a radio in it. Since I don't have an engine or radio to fit the good old paper airplane, I'll fit the paper airplane to the engine and radio. But which paper airplane should I model? It needs to be easily recognizable, so I'll choose the classic Dart design, since it seems to be the most common paper airplane.

Then, several other questions arose. How complex should the model be? How big should it be? What's the best method to control it? How should it be constructed?

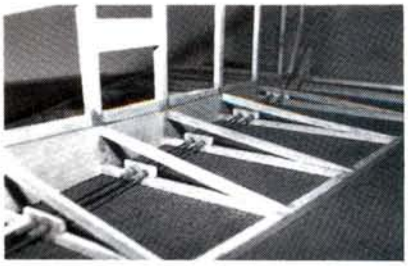
The first question—on complexity—was easily answered. Since I wasn't assured of success, I decided to keep the design simple. Furthermore, I decided to invest as little money as possible, and this meant using my standard-size airborne flight pack and an available engine. Also, in the interests of simplicity, my Skydart's flight would mimic that of a typical paper airplane, with one exception—it would be powered. A



Basic "fuselage" framework with main rib cut, sanded and notched.



Ply firewall and triangle stock tie the aft fuselage and wing together.



Square balsa "spars" form wing contours. Note pushrod supports from balsa and plastic tubing.

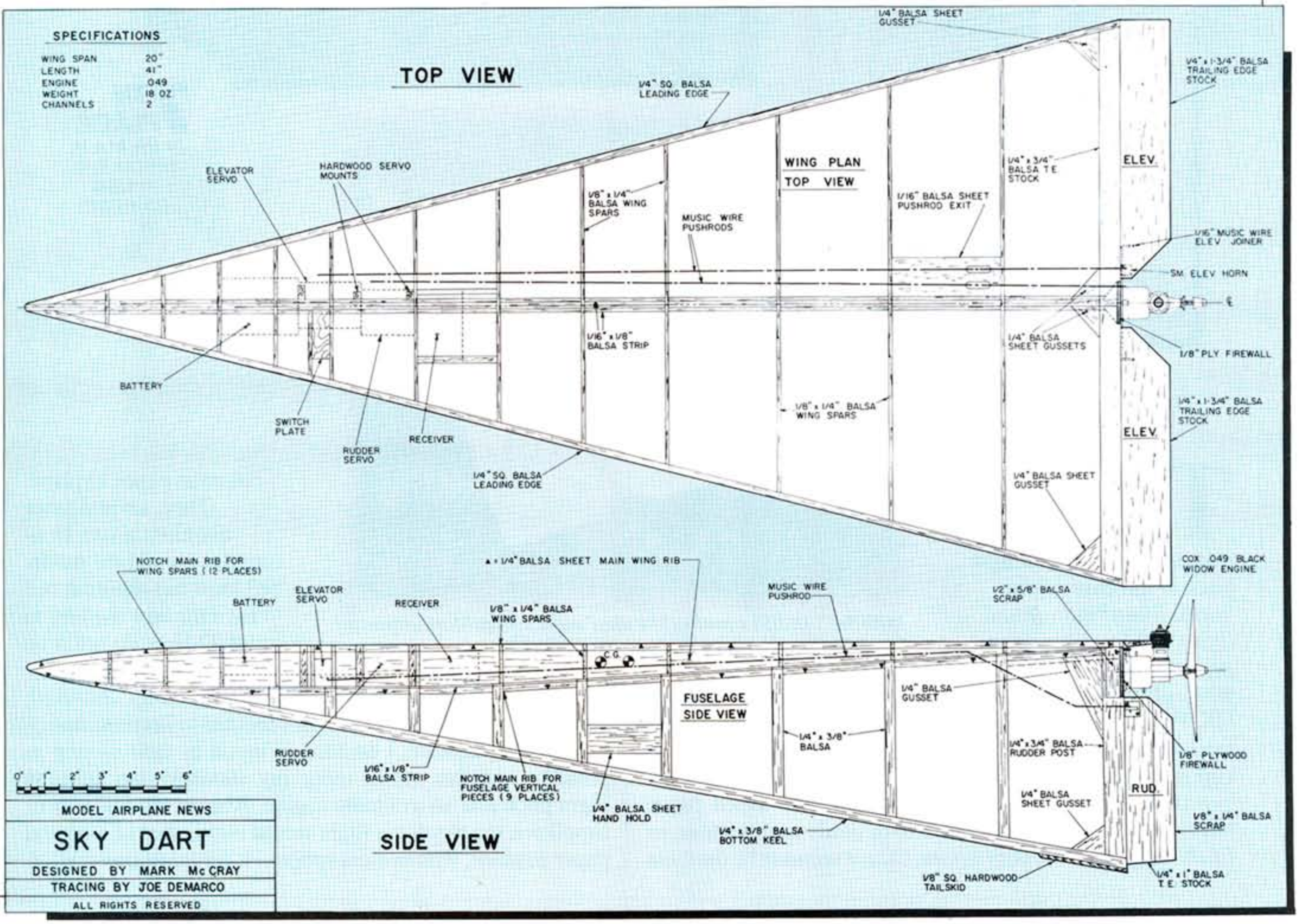
flight would start with a hand-launch, continue with powered flight until the fuel was exhausted and conclude with a glide to landing. This could be accomplished with two channels for flight control and an engine without a throttle control. I chose a Cox* .049 reed-valve engine for power, since it has an integral tank, and it would run backwards for the pusher arrangement that I had in mind for the design.

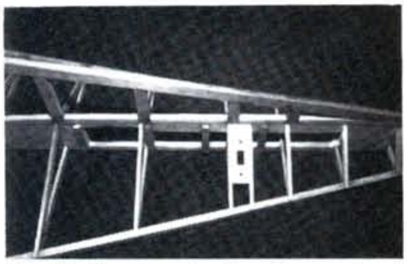
With the flight pack and engine choices made, the Skydart's overall size could be determined. I estimated an overall weight and then calculated the wing area using a desired wing loading. The wingspan and chord were calculated. The wingspan was increased slightly, and the overall fuselage height was made proportionally shorter than on a classic Dart paper airplane. Also, to simplify the structure, the wing trailing edge was made straight rather than swept.

To determine the controls for the Skydart, I built a sheet-balsa version of the Dart paper airplane from 1/32-inch sheet balsa to the same dimensions and CG as a typical paper version. I then experimented with different control surfaces. An elevator on the wing trailing edge proved suitable for pitch control; for roll control I tried combining ailerons with the elevator, or elevons. Setting differential in, resulted in unpredictable flat turns or nice axial rolls when flown. After several flights, this configuration was abandoned due to its sensitivity. Next, I tried a rudder on the rear of the fuselage. When in flight, rudder deflection resulted in nice banked turns. A simple rudder and elevator had the added benefit of needing only simple controls, with no mechanical or electronic mixing, as would be required for elevons.

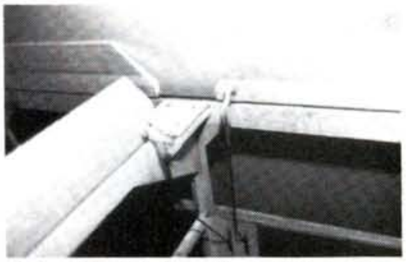
The last major question to be decided was the design of the

FULL-SIZE PLANS AVAILABLE . . . PAGE 116.

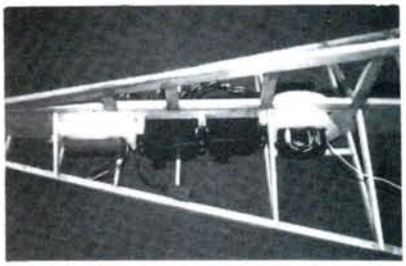




Detail of fuselage structure shows cut-outs for flight pack and switch mount.



Aft section details pushrod (2) installation and firewall.



Completed flight-pack installation. Battery and receiver are retained by foam; servos mounted on hardwood blocks.

structure and, related to that, the choice of airfoil. For this, I searched through old model magazines and books until I found an article on R/C Double Deltas by Bill Poythress in the 1964-1965 "Model Aeronautics Year Book" by Frank Zaic. The Skydart structure incorporates ideas from this article. The airfoil is also similar, but was thinned to allow just enough depth for the flight pack. The engine thrust line was set to be parallel with the main rib top surface.

The final step before beginning construction was the drawing of the plans. I also had to make a preliminary estimate of the correct flight-pack placement to maintain the predicted CG. The flight pack and engine were weighed, and the CG of the structure was estimated. The flight-pack placement and arrangement was varied until the predicted CG condition was met.

Because of its shape, the attitude of the Skydart can be difficult to determine while flying, and this model is therefore not recommended for the newcomer to flying.

Completed framework ready for covering.

CONSTRUCTION: The first step in construction is to check that the CG will be satisfactory with the chosen airborne flight pack. The prototypes used standard-size servos, a 5-channel receiver and a 550mAh flat battery pack. If a lighter flight pack is to be used, weigh the components and divide this value into 100; the result is the distance from the nose to the CG of the airborne pack. The components can then be arranged to stay within the calculated CG. The structure can be modified as necessary to accommodate particular calculated placements.

The fuselage is built first, and then the wing is built inverted around the fuselage. The entire structure is then removed from the plan and is ready for radio and pushrod installation, covering and engine mounting.

Choose medium-hard balsa for the fuselage stringer, wing leading edges and trailing edges and a medium grade for the remainder of the structure. I used CA glue throughout.

Cut the main rib from a 48-inch length of sheet balsa. If a 48-inch length isn't available, a 36-inch length can be used and spliced. (Place the splice at the aft end of the rib.)

Notch the upper edge of the main rib for the wing spars and wing trailing edge, and notch the lower edge for the fuselage vertical members. Make partial cuts for the flight pack. On each side of the main rib, mark the lower rib contour line.

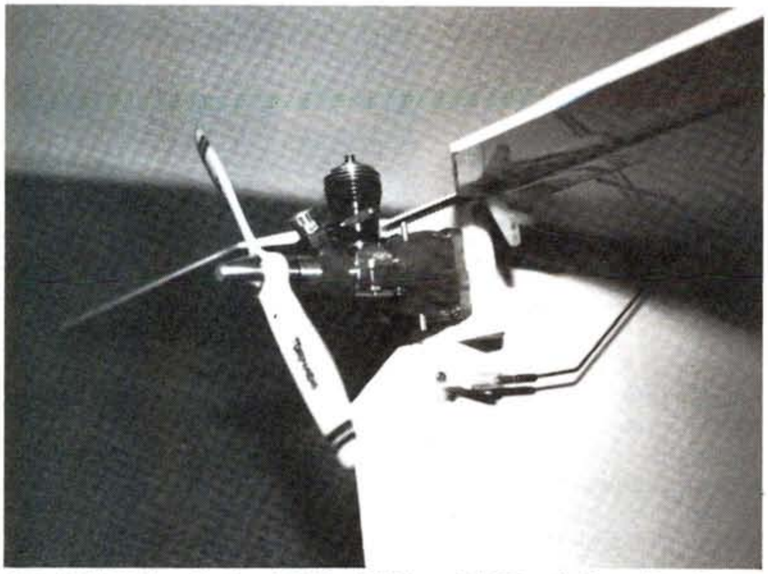
Cover the plan with wax paper, and pin the main rib in place on the fuselage plan view. Glue the fuselage stringer and the rudder post to the main rib. Note the notch in the rudder post for the engine firewall. Next, add the fuselage vertical members, gussets, hand-hold and hardwood tailskid.

Before starting to build the wing, the leading edges need to be formed to the correct curvature at the forward end. As with the main rib, it's preferable to use 48-inch lengths, but if these aren't available, the leading edges can be spliced. (Remember to place the splice at the aft end.) Make two 9-inch, equally spaced cuts along the length of each leading-edge piece, and bend and glue to the curvature shown on the plans.

Pin the formed leading edges in place on the plan view of the wing. Position the bend up, and note the angle cut at the forward end where the leading edges attach to the fuselage. To provide the proper spacing, temporarily place a scrap piece of sheet balsa vertically on the building board between the two leading edges. Glue the wing trailing edge to the leading edges, and note the notch for the firewall.

Measure, cut and glue the upper wing spars starting from the aft end and moving forward to the radio compartment area.

Next, remove the spacer at the front of the wing, and place the completed fuselage on the wing plan view, inverted on the fuselage center line and perpendicular to the building board. Glue at the wing leading edges, upper wing spars and the wing trailing edge. Add the gussets at the wing and trailing



T.D. .049/.051 installation. .049 Black Widow with T.D. cylinder and head has been used with success.

MATERIALS

- One 1/4x3x36-inch balsa
- Two 1/4x3/8x36-inch balsa
- Three 1/4x1/4x36-inch balsa
- Seven 1/8x1/4x36-inch balsa
- Three 1/16x1/4x36-inch balsa
- One 1/4x1x36-inch trailing-edge stock
- One 1/8x1 1/2x1 3/4-inch plywood
- One 1/8x1/4x12-inch hardwood
- Two .051x36-inch music wire
- One piece 12-inch nylon tubing
- Two solder couplers, clevis and control horns
- One 6-foot x 24-inch roll of covering material

edge, and trailing-edge fuselage junction. Next, cut and glue the lower wing spars. Use the lower rib contour line as a guide for placement at the main rib junction. At the wing leading-edge junction, cut the lower wing spars at an angle, so that there's an uninterrupted line from the bottom of the lower wing spar into the wing leading edge. Do *not* install the lower wing spars that are in the radio compartment area until later.

Cut the engine firewall, and drill for the chosen engine-mounting screws. (Wood screws or flat-head screws with blind nuts can be used.) Glue the firewall in place, making sure that it's perpendicular to both the rudder post and the wing trailing edge. Add the triangle stock that ties the firewall to the fuselage sides.

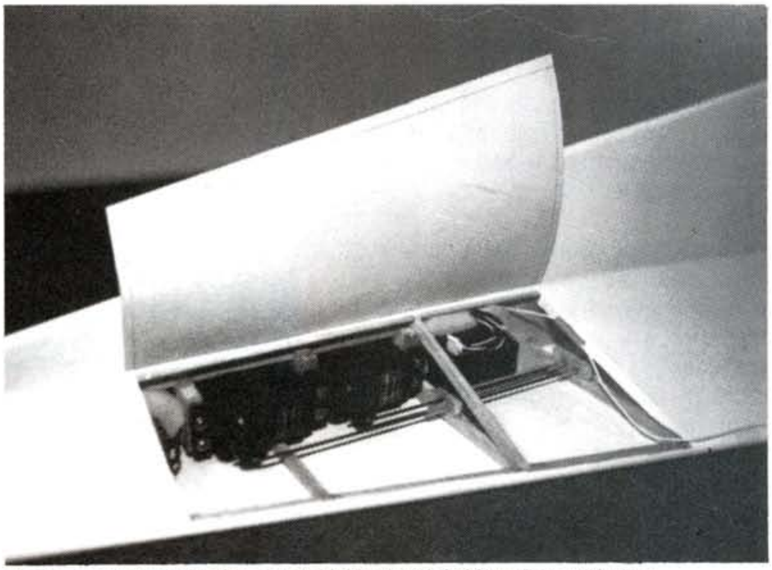
The basic structure is now complete and can be removed from the building board. Glue in the remaining upper wing spars and complete the cuts in the main rib for the flight pack.

If the radio to be used doesn't have servo-reversing capability, make sure that the servos you choose will operate the rudder and elevator in the correct directions. Because of the limited space, the output arms must be positioned downward with the inner hole being used.

The servos are mounted piggy-back-style, sharing a mounting block. The elevator servo is mounted forward with its output arm further outboard from the fuselage center line. The battery and receiver are held in place with foam rubber.

The pushrods are installed after the servos have been mounted. The pushrods consist of .051-inch-diameter music wire running through short sections of nylon tubes. Use a Z-bend at the output arm and a threaded coupler soldered to the music wire at the control-surface end. Using the plan as a guide, bend the rudder and elevator pushrods. Slide one-inch sections of the pushrod tubes onto the pushrods between the wing spars. Position the pushrod tubes on the wing spars, and glue them in place with scrap balsa at each pushrod tube. Solder a threaded coupler to the end of each pushrod.

Add the remaining lower wing spars and the switch plate. The hatch for the radio compartment is made from a piece of manilla folder. Next, add the sheeting that runs between the lower wing spars and butts up against the main rib on each side. Make up and glue in the pushrod exits that span the two lower wing spars. Round-off the wing leading edges and fuselage bottom stringer before covering. Fuelproof the firewall and its support, and then cover the structure with an iron-on-type covering. Start with the fuselage, then cover the bottom of the wing, and then the top of the wing. Construct the rudder and elevator and then cover them. The elevator halves are joined with a U-shaped piece of music wire.



Radio compartment with manilla-folder hatch held in place with tape.

The covering material can be used for the elevator hinge, but conventional hinges are recommended for the rudder. Set the rudder throw for ±3/8 inch, and the elevator for ±5/8 inch 1/16 inch up at neutral.

(Continued on page 52)

Basics of Radio Control

by RANDY RANDOLPH

A GOOD BUILDING BOARD is one of the most important things a modeler can have. It should be absolutely flat, and it should be fairly easy to stick pins into. Years ago, soft, pine drawing boards were available at reasonable prices, and they were great. They had metal reinforcements along the sides to keep them true, and you could easily stick pins into them. Unfortunately, the price of such a board is now almost as much as a couple of good engines, so substitutions are in order.

Picture No. 1 shows one alternative. Three-quarter-inch plywood is readily available and, by being very selective, you should be able to find a piece that's quite flat and true. Make it "pinable" with foam-core board, which is available at most hobby and craft stores. Foam-core board is a sandwich of foam and cardboard, and it's available in 3/16-and 1/4-inch thicknesses. One or two layers of foam-core board epoxied over the plywood and trimmed flush with the edges make a very good building board.

Use epoxy, or 3M spray-on adhesive, because the white glues will cause the top ply of the plywood to swell slightly and distort the surface of the board. The CA adhesives are a little expensive for this type of work and are hard to handle over this large an area. Both plywood and foam-core board are available in 4x8-foot sheets, so almost any size of building board can be made.

Conveniently, when the top of the board becomes worn, you can simply sand it smooth and glue on another sheet of foam-core board. (The top will become scored with cuts from your razor knives.)

Another alternative is a piece of Formica, e.g., a counter-top cutout, which makes an excellent cutting board. It won't dull the knife as quickly as plate glass will, and it will withstand a lot of slicing.

A good, true building board is hard to come by without spending an arm and a leg—Or is it?

AM, FM, 3IM Narrow Band...
Some time ago, this column was devoted to a description of the various systems that transmit commands via radio signals. There's so much misinformation about these systems that a short review is in order:

First, the words "narrow band" in front of "FM" don't mean that the transmitted FM signal is any narrower than an AM signal; it simply means that it's narrower than a regular FM signal. Both NBFM and AM signals occupy exactly the same width on the radio frequency spectrum if they both carry the same information.

Over-modulation is a condition in the transmitter where the information fed to the radio signal is too strong. It will interfere with adjacent channels, but over-modulation of an NBFM signal causes much more interference than the same situation on an AM signal. Both conditions are easily corrected by a qualified technician. Don't throw that old transmitter away; have it checked, have any modulation problems solved, and it will be as "narrow band" as any you can buy.

Picture No. 2 shows three of the four pilots who are engaged in a pylon race. The pilots and their planes all change position many times during a heat, and they are never more than ten feet apart. At no time during the hundreds of heats I've seen in the last ten years were pilots bothered by any form of third-order modulation. The term third-order modulation interference (3IM) refers to the saturation of the first stage of a receiver by a strong signal. Years ago, when radio receivers were crystal sets, two strong signals could be heard at the same time; this was called "cross-modulation." Later, with the advent of vacuum tubes for

BASICS OF R/C

What are these guys looking at anyway? Must be flying the same plane!

receivers, the problem almost disappeared, and would reappear only occasionally when very near a powerful broadcast station. It was called "front-end overload" by then, and this term correctly described the condition.

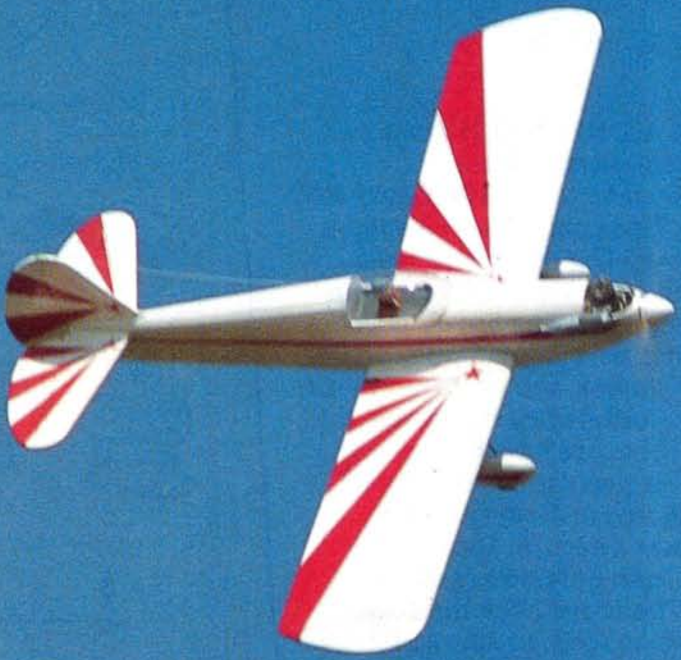
When transistors came on the scene, strong signals would turn them into crystal detectors, and hearing two stations at the same time became a problem again. Then, just as now, appropriate receiver design was the cure. Whoever tells you that this 3IM stuff is transmitted, and that you should get away from the other pilots as far as you can, is pulling your leg.

Test instruments are more prone to front-end overload than our receivers, because they're designed to respond to signals in a wide frequency range. Many an engineer has fallen prey to false readings on his "scope" and claimed new discoveries. In my company, if they did it twice, I fired 'em!

• We're always interested in comparing airplane performances. The simple formulas given a while back answer many of our questions, but not all of them. Some time ago I put together a computer program that goes more deeply into the subject. Over the years, items have been added, and the last of these was Joe Wagner's wing-volume formula. Although my program is written in Atari Basic for 8-bit machines, the conversion to other forms of Basic isn't difficult. A friend has offered to provide a print-out of the program for the cost of mailing. If you're interested, a dollar bill to P.O. Box 271048, Dallas, TX 75227, will get you a copy. ■

Field & Bench Review

Big, Beautiful and Balsa... What Could Be Bad?



GREAT PLANES

Super Sportster 90/120

by DICK PURDY

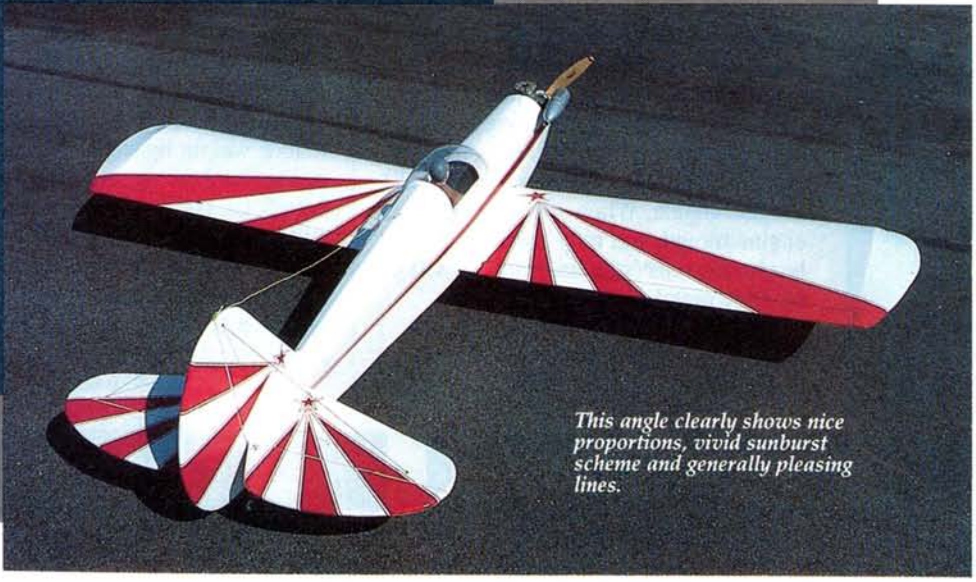
AS THE CURTAIN RISES, we see an office at Air Age Publishing with *Model Airplane News'* Editor, Rich Uravitch, seated behind his desk. He's discussing his policy on and attitude to "Field and Bench Reviews" with two staff writers. His message is clear: "Our obligation to our readers is to be factual and informative, and that includes being critical of products when we need to be."

Resolving to "tell it like it is," and carrying a heavy box from Great Planes*, I leave the stage...

The box contained the new Great Planes Super Sportster 90/120, and I was determined to evaluate it critically—no wimpy product endorsements from *me*, Mr. Great Planes!

Photos by Rich Uravitch.

book with a parts list at the back. The kit includes about 250 wooden parts, seven plastic parts and approximately 75 pieces of wire, nylon and hardware. One of the two small balsa blocks that go at the plane's nose was missing, but since the other piece was included, I simply duplicated that to overcome this minor shortage.



This angle clearly shows nice proportions, vivid sunburst scheme and generally pleasing lines.

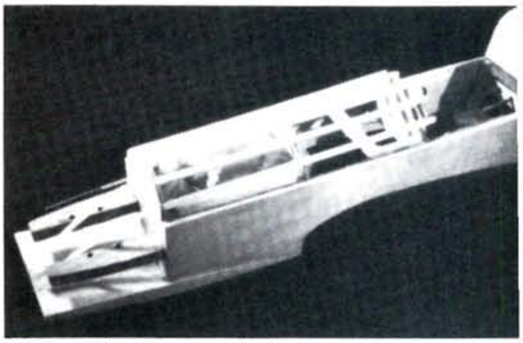
After checking the parts list, I studied the book and the plans. The drawings are exceptional, and the book is about the best I've seen. (I'm trying to be super critical here, so I'll "keep my cool" and continue to look for flaws.) The book is a real course in model construction, with lots of photos, numbered steps and clearly written text. I did find an error on page 18, step No. 1, dealing with the installation of the wing dowels. The text refers to a ⅛-inch "balsa" dowel plate, but the dowel plate is actually ⅛-inch *plywood*. Aha, Mr. Great Planes, I gotcha!

When I opened the box, I found that all parts were bagged in plastic or banded together in groups of similar materials. I found two large, exceptionally well-drawn plans (rolled to prevent creases) and a 40-page instruction

Despite the abundance of parts supplied with this kit, these aren't provided: wheels and collars, tank and tubing, radio,

Head-on shot of final approach shows only muffler and tail wheel hanging out in the breeze.

Stone-faced Williams Bros. pilot brings up revs on O.S. prior to takeoff.



Nose section leaves no doubt as to "where's the beef" Hardwood engine mounts are integral with structure.

Type: *Large-scale, sport*
Span: *72 inches*
Weight: *9½ to 10 pounds*
Area: *950 square inches*
Wing Loading: *22-24 ounces/square foot*
Power Required: *.61-.91 2-cycle; .90-1.20 4-cycle*
Number of Channels Required: *4*
Suggested Retail Price: *$119.95*
Features: *All-balsa built-up construction; good flying qualities; photo-illustrated instructions.*

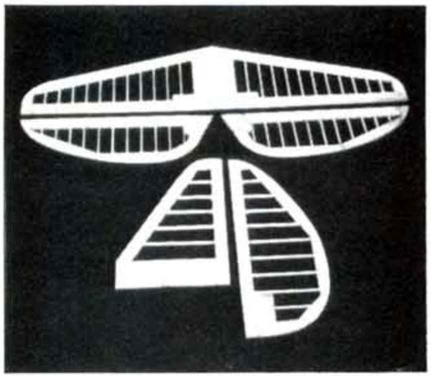
engine, covering, adhesives, prop, 3-inch spinner and pilot figure. This isn't unusual. The spinner is really important on this plane, because the shape of the entire nose section conforms to the conical spinner and the spinner-backplate diameter.

There are several options open to the builder, and these choices should be made at the outset of construction. The first choice is whether you prefer tricycle or tail-dragger landing gear; parts are supplied for both options. You may also choose a .90 2-cycle or a 1.20 4-cycle engine. When selecting an engine mount, you may choose the hardwood rails (supplied with the kit) or an alloy metal mount to suit your engine. Regarding elevator servos, the options are either to use one large servo, connected by a forked pushrod to the two halves of the elevator, or to use two smaller servos, which are individually connected to each half of the elevator. I chose the tail-dragger landing gear, an O.S. Max 90 FSR 2-cycle engine mounted on hardwood rails and two Futaba* S-38 servos for the elevator.

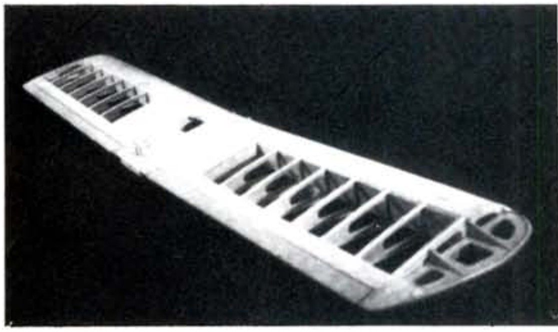
CONSTRUCTION: The manual starts with the tail feathers. Each component in the empennage is built up with balsa ribs inside a hefty balsa frame, and this frame is then covered top and bottom with 1/16-inch sheet balsa. The result is a very light, yet strong frame. Plywood segments are built into the framework for control-horn mounting.

The wing is assembled next. It's framed with 3/16-inch balsa ribs, which are die-cut with lightening holes. The wing tips are die-cut plywood, also with lightening holes. The lightening holes reduce weight by slightly over two ounces, and this is, of course, very beneficial. Hardwood spars, cap strips and sheeting at leading and trailing edges are used, and balsa web reinforcing is an integral part of what will be a very rugged wing. Fiberglass cloth strengthens the center area. The

(Continued on page 79)



Basic airframe components prior to covering. Tail group above is built-up for weight savings. Same story for lightening holes in wing structure, far right.



CAD System Employed on SS 90/120

IN MY DISCUSSIONS with Jim Schmidt, I was interested to learn that the SS 90/120 kit was developed and drawn up using their new Computer-Aided Design system for the first time. I asked Jim to give me a little more background on this, and he sent me a letter which is quoted, in part, as follows:

"In the fall of 1987, we began looking into the feasibility of using a CAD (computer-aided design and drafting) system to speed up the plan-drafting phase of our Research and Development department. After 60 hours of formal training and a significant investment, we now have a fully operational CAD system.

"The learning curve of the typical CAD operator is such that it usually takes months to reach the level of productivity equal to that of manual drafting. But, with CAD, it's possible to far exceed manual drafting as proficiency is improved. As a result, the development of the Sportster 90/120 plans was very time-consuming and, quite frankly, there was a time when we had our doubts about whether or not we had made the right decision.

"With CAD, moving part of a drawing to a different location is... a simple matter..."

"As far as productivity is concerned, we have now far surpassed what we were doing manually. However (and this is the real bonus), we are now getting a degree of accuracy that is nearly impossible to achieve manually. Our plotter draws lines with an accuracy of plus or minus 0.1 percent, with repeatability of plus or minus one thousandth of an inch. This accuracy really shows up when using CAD to make drawings for the die-cutting dies. Formers always come out symmetrical, and multiple-rib dies are nearly perfect. Parts drawings are easily extracted from the plans using CAD (rather than tracing them manually), which means that the kit parts agree with the plans every time.

"Our CAD system now uses a lettering style that is nearly identical to our former 'template and scriber' method of lettering. Therefore, it's actually difficult to tell whether they were drawn manually in 100 hours or CAD-plotted in 45 minutes.

"Another great feature of CAD is its flexibility. If you've ever drawn a model airplane plan, you know that you must plan the layout of the sheet very carefully before you begin, so that you'll have enough room to show everything. If you screw up, you either have to erase part of the drawing and re-draw it, or start over! With CAD, moving part of a drawing to a different location is such a simple matter that you can develop the drawing one part at a time, then move things around later to fit the size of paper you'll be using.

"But the real beauty of CAD is that you never have to draw the same thing more than once. For example, it took me eight hours to create the drawing of the OS 190 4-cycle engine on the Super Sportster 90/120 plan. That engine drawing is now in a permanent drawing file, so I can call it up anytime in the future and insert it in a new drawing in a matter of seconds. In time, I will have individual drawings of all the standard engines, fuel tanks, wheels and hardware that are used in our kits, and that will really speed things up." ■

Giant Steps

by DICK PHILLIPS

IN MY TWO PREVIOUS articles, I discussed drawing a plan for a large 1/4- to 1/3-scale model. Last month, I talked of beginning the actual plan, and I showed the design for the tail-group members.

It's important to decide where to place the various sub-assemblies on the plan sheets. The fin and rudder may be placed in their true locations and shown on the fuselage side view. The stab and elevator could go on the top view of the fuselage or may be placed in any other convenient area. Ideally, the surface of the plan should be used efficiently, but not so well used that material is crowded together, as this causes problems when building from the plan.

Space must be provided for the wing ribs, fuselage formers and any other special shapes which will be required in construction. Items like landing-gear plates, cockpit floor, cabane strut mounts, etc., will all require space on the plan sheets. With careful planning, the appropriate parts of each sub-assembly may be placed on the same sheet. Alternatively, you may decide to place all the patterns on a single sheet, which can be cut up as patterns for parts as required.

Most builders prefer to have both wing panels on the plan. Many good plans have been rejected by builders because it's necessary to either build "blind" on the back of the sheet, or to oil the sheet to make the paper opaque and the plan visible through the back of the paper. It's better to have both panels on the plan. This can be accomplished by keeping one wing panel and all its patterns on one sheet, then reproducing the sheet twice, once the right way round and once reversed. The printing on the reversed sheet will also be reversed, but the two sheets will be as identical as possible. Alternatively, you can trace the reversed plan onto a new sheet of Mylar for the missing wing panel; this also makes a very accurate second wing panel. (Note: This can be done by folding the wing plan sheet over itself and tracing the other panel from the first one. This has the advantage of keeping both wings on the same sheet. In addition, it's possible to align the first wing panel with the second and to duplicate the panels as one assembly. This necessitates sharply folding the Mylar, but the fold won't usually print when the plan is duplicated.) Alternatively, a master plan of the wing may be traced twice (once from each side), so producing a full-span wing plan.

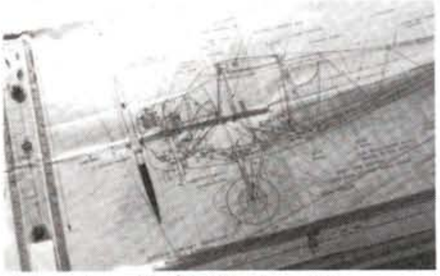
However the details are to be located on the plan sheet, you should aim to make efficient use of the space available (no large areas of blank paper), but don't crowd the work so much that it's difficult to work from the plan.

One other area which requires care is the drawing of the full-size patterns for the landing gear (either wires or a plate) and cabane struts. These must be drawn accurately, so that the builder can make them up to the correct size and shape. With some complex shapes, this isn't easy to do, but it must be done and done accurately. It may be necessary to show more than one view of a wire part in order to convey the correct shape and dimensions to the builder.

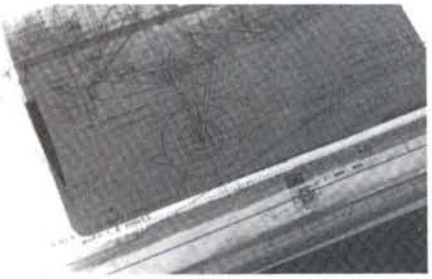
Now, on with the wing. Here again, the wing in plan form may be duplicated at the correct size in the same way as we did the tail group. The base (or reference) line may be the center of the main spar, the leading or trailing edge, or whatever is convenient. The other reference line should be the outside edge of the root rib. Once these lines are laid out on the new plan, it's a relatively simple matter to transfer the dimensions, properly reduced, to the new plan. As with the tail-group members, measurements are taken from the three-view, using our prepared scale ruler. These dimensions are then divided by a figure appropriate to the scale of the drawing. In our case, the full-size dimension is divided by 1/3 (or multiplied by .333). Using a calculator to multiply the full-scale dimension will provide the scale dimension wanted, and the use of an engineer's rule (marked in tenths of an inch) will make transferring these dimensions much simpler than by using a conventional rule marked in 1/16-inch increments.

Another decision may be made here as to whether to use the scale wing-rib

Shows basic construction of specially designed scale ruler. Completed ruler is shown, marked for Westburg Monocoupe.



Inboard profile of Westburg Monocoupe three-view. Such drawings contain everything required for the preparation of an accurate plan.



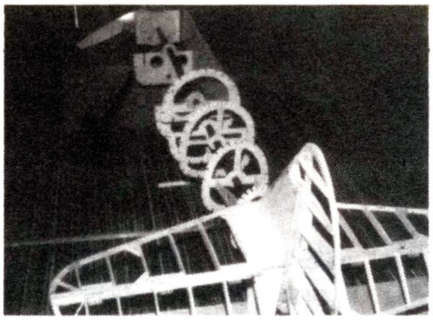
Plastic graph overlay used for enlarging smaller parts of plan to new scale. Particularly useful for areas which are irregularly shaped.

locations or to reduce the number of ribs used in the model. Our construction is a good deal stronger, size for size, than is usual with full-scale plans, so it's possible to reduce the number of ribs significantly without compromising structural integrity. However, if a scale model is being drawn, the model plan should naturally be as nearly identical in appearance to the original as possible. (Note: Reducing the number of ribs to one half the original number wouldn't be unreasonable. In a sheeted wing where the ribs aren't visible through the covering material, this would be quite in order and wouldn't compromise appearance at all.)

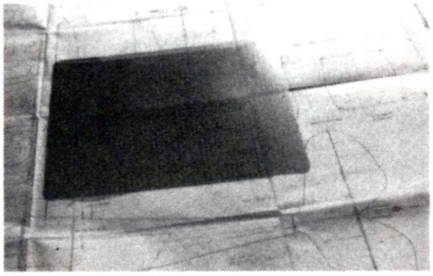
When the interior layout of the wing has been completely drawn on the new plan, the internal workings of the model parts may be added. This step includes any operating linkages for ailerons, flaps, etc., and should include a provision for strut- or landing-gear-mounting hard points, etc. Remember that in larger models, where each wing panel is a separate assembly, it's a good idea to provide separate servos for each wing panel. In other words, with both ailerons and flaps, two servos would be used in each wing panel. This is good practice in providing adequate power to move these surfaces under flight loads, and it also makes connection easy when the model is assembled. It's always easier to connect a number of servo leads than it is to connect several mechanical linkages. In addition, the servo connection doesn't get out of adjustment as a mechanical connection can and will. (Note: When using long servo leads, the receiver should be checked to ensure that it isn't sensitive to the "noise" which can be generated by such long leads. There are several methods which may be used to minimize or eliminate this "noise.")

Here again, the wing plan(s) shouldn't be abandoned until all the required details have been added. It's tempting to go on to something else before doing the tedious detail work, but resist that temptation and finish everything before moving on. It's easy to forget something and not go back to do it, so omitting some important detail. If you can't do neat, legible, freehand lettering, use a lettering guide.

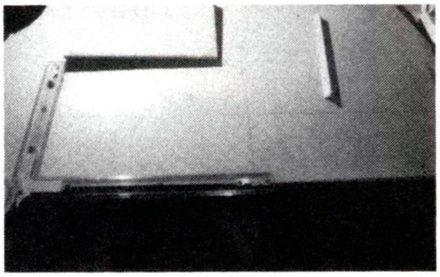
Such details as color-separation lines, identification letters, numbers and any other decoration may also be added at this time. This work should be done either in dotted lines or in a lighter line than the drawing. It contributes to the completeness of the plan, but it shouldn't detract



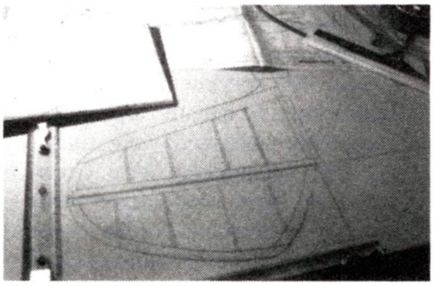
Ziroli Giant Stearman by **James Fender** *of Kingsville, MO, uses tube as crutch. Alternate method described in text.*



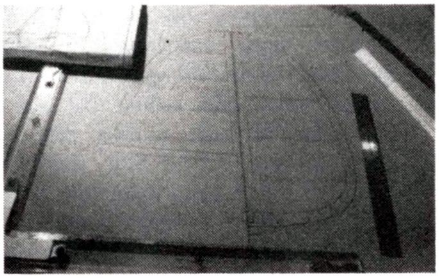
Graph overlay in use for enlarging cross-section of fuselage. Squares are laid out to suit the degree of enlargement required.



Base lines for stabilizer and elevator. Vertical line represents center line of fuselage; horizontal line represents hinge line between stab and elevator.



Half stab and elevator completed, showing conventional model construction. Other half may be made by tracing this part of plan, reversed, ensuring exact duplication.



Vertical fin and rudder drawn using rudder hinge line and top or rudder as reference lines. Drawings not yet inked for reproduction and permanence.

from the building details, which are required for construction.

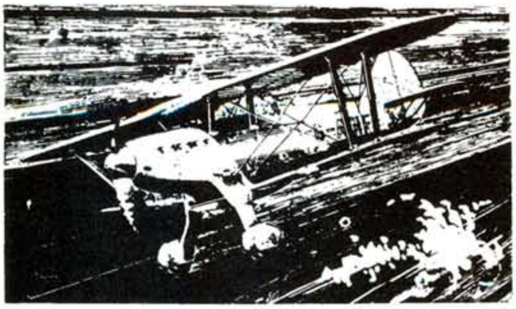
The fuselage is the hardest part of the plan to draw. It should have the bulk of the detail required, and it will take careful thought to convert the original construction techniques to modeling practices. The shape and type of the original fuselage will govern this work. If the original fuselage was fabric-covered, we want to copy this in the model. If the full-scale fuselage was metal-finished, then we need only provide a structure on which to mount the sheet covering material, and the appearance of the unseen fuselage interior is of little consequence.

The most common modeling practice is to construct the flat fuselage sides of stick material, fasten them together with crosspieces, and then add whatever formers are needed to provide the desired shape to the fuselage.

Don't forget that a side view of a fuselage isn't necessarily the same length as the actual fuselage side. In most cases, the fuselage is wider at the front than at the rear, so the side view is foreshortened slightly when viewed directly from the side. (e.g. Measure the three-view being used from the front of the cowling to the rearmost part of the rudder along the center line of the fuselage. Next, measure this same distance on the top view, following the outer edge of the fuselage side, and you'll find that the second measurement is slightly longer than the first.) Even on 1/10-scale drawings of the Monocoupe, there's a 1/16-inch difference between these two measurements. This isn't a large difference, but the 'Coupe is very wide at the front of the fuselage so the difference is minimal. On a fuselage that's very slender forward, wide at the cockpit or cabin area and then tapered back to near zero aft, the difference could be significant. In most cases, this slight difference may be ignored, but if it *is* ignored, the model will be slightly shorter than if it had been drawn accurately to scale.

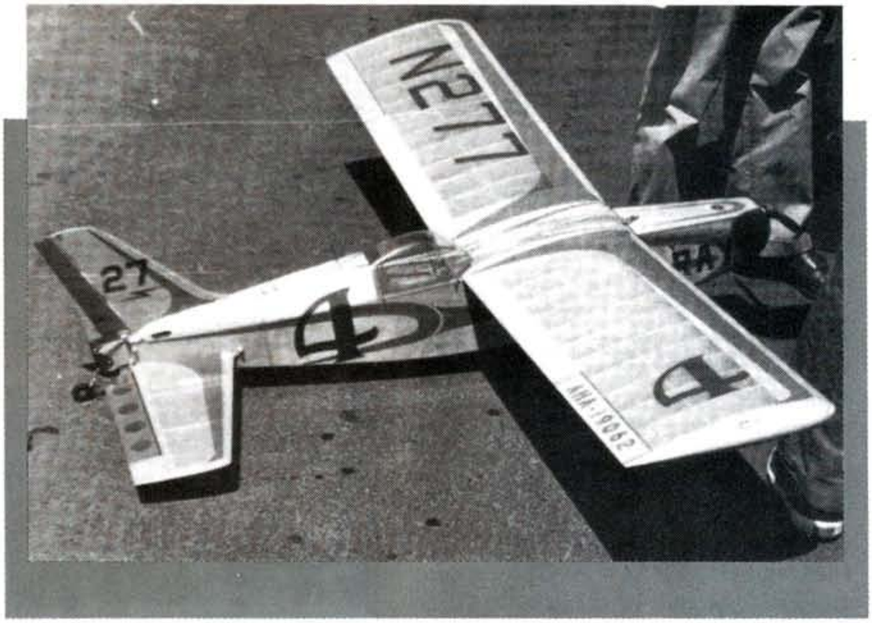
Of course, there are other methods of fuselage construction. Nick Ziroli uses a crutch in many of his plans. This is a stick and/or sheet material base. It's usually made up to run between the sides of the fuselage, and it runs from the fire wall to the rear of the fuselage. The formers or half-formers are erected on this crutch, tied together with stringers and longerons, and the entire structure is then sheeted or fabric-covered to complete it. (Note: A

(Continued on page 110)



Golden Age of

by HAL "PAPPY" DeBOLT

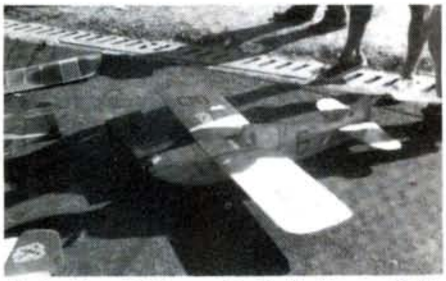


1. The first R/C racing was AMA Pylon, quite unlike Formula I. Typical racer: Note 27.255-frequency decal on fin; vertical antenna and wing-tip weight.

IT RECENTLY OCCURRED to me that perhaps, if you knew the R/C equipment I'll be discussing in future columns, you might have some additional historical input or you may have a friend who has some relevant experience. Especially interesting are details of the equipment itself and any information about the manufacturer. I'd also like to hear about personal experiences using the equipment or planes: What did it do for you? Anything unusual happen? How does it compare with modern equipment? While my column has taken us into the history of early proportional, we can still digress if you have something to contribute from earlier eras. I continually find people with experience to share. Remember, this is *your* OT R/C place, and we want you to enjoy and be part of it.

I've already discussed the "Quadraplex" by Don Brown as possibly the first commercial propo system. Next, the Bonner system. After that I'll move to the Space Control, Digitrio, Orbit Analog, Sampey, ACL, Min-X and Kraft—all early propo systems—and I'll add the Micro-Avionics and PCS. Unfortunately, I only have extensive information on the Bonner, Space Control and Orbit. I know that many of you oldsters did a lot of flying with the rest, and I'd appreciate anything which you can contribute. How about you, Dick Allen? I know you did a lot of flying with the ACL system.

I keep getting requests for sources of OT R/C plane plans, and this shows that building is underway and that there's a desire for more. I recently mentioned a need for Doug Spreng's "Stormer." Why the Stormer? Doug was involved in the development of the first digital propo system with his close friend Don Mathes. Before that, he became a proficient R/C competitor while reeds were still in vogue. Another outstanding West Coast flyer was Dale Root, who opened many eyes with the performance of his "Ascender" design, which was an unusual configuration for the day as a "shoulder wing" with sleek lines.



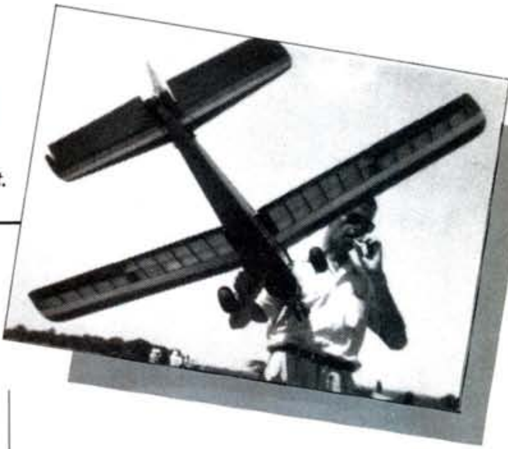
2. Another AMA racer by Keith Storey. AMA rules required 720 square inches of area and a .19 engine.

Doug's Stormer came along in the late '50s, and, with a great Nats win, it achieved country-wide popularity. This shoulder wing was large by today's standards (about 800 square inches) and was powered with various .60 engines. Novel for the time, a trike gear with steerable nose wheel was used. The Stormer's outstanding asset was its easy flight, while being completely maneuverable. The appearance was quite modern; we have one photo showing Bob Dunham acting as mechanic for a friend at an early World Champs.

The news is that Harvey Thomasian (369 Brigham St., Northboro, MA 01532) says he can supply Stormer plan copies. The copying process is apparently expensive, so the post-paid price is $20. Contact Harvey directly.

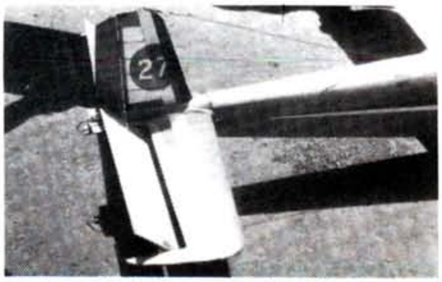
R/C pioneer Chet Lanzo sent some interesting photos from an early '50s Nats, but gave no information about them, so I'll have to guess. Perhaps someone else will have more pertinent information. Photo No. 1 appears to be an early AMA-style pylon racer. The "Ray" name on it may indicate that it's a Lou Andrews effort. Any comments, Lou?

3. Storey's racer internals. Note bulky R/C. Keith was Champ two years running.



4. *Dale Root, San Francisco and his outstanding "Ascender" for early pattern event.*

Photos No. 2 and No. 3 are of Keith Story's Nats-winning pylon racer; Keith had "the message" in those days! I think Photo No. 4 shows Dale Root and his "Ascender." Photo No. 5 shows the Ascender's tail assembly and a very efficient elevator system that has somehow been overlooked with the passage of time, but should be noted by today's designers. We could call it an "aerodynamic elevator," as the airflow not only provided the elevator action, but also some of the power to move it. The surface looks abnormally large, because only two-thirds of the area acts as an elevator; the other one-third provides the power. A true airfoil section was used in the elevator; this was hinged at the center of lift (about one-third of a chord). Thus, when deflected, the airflow striking the forward one-third created a force that tended to move the elevator in the desired direction. The assets of the aerodynamic elevator were twofold. First, it required much less actuator power to move it in flight. (We didn't always have servos with "Atlas power"!) Second, and perhaps more important today, it provided an exponential action. Until the elevator L.E. moved beyond the stabilizer T.E., only two-thirds of the area was effective. After that, the effect was proportional to the amount of movement. When we first developed this concept, the major objective was to cure a servo-power problem, and it did this effectively. The surprise was the smoother, more docile elevator response, especially with the "bang-bang" full-deflection reed servo action.



5. *Ascender had an aerodynamic elevator; details in text. Note 27-frequency decal, as rules required. Good idea for use today?*

Sometimes I wonder if we modelers take advantage of all conceivable possibilities. These aerodynamic control surfaces are widely used in full-scale aviation, and Frise-style ailerons are well-known. Could we be overlooking something that was proved years ago?

Continuing with history, the chronology is misty—perhaps because the arrival of proportional was just as explosive as had been the advent of CB and, later, the reed systems. One day, we only had reeds for multi; then, within a few months, there were several forms of propo available. There was also much controversy about whether the new systems were as good as reeds and which propo system was the best. An R/Cer had much to wonder about! (This was in about 1965.) We *do* know that such complex systems didn't happen overnight, so let's track down those who did the original groundwork.

The *ability* to have fully proportional R/C should apparently be credited to Jerry Pullen of California, and in fact, all the first exotic proportional systems originated in that state. It's said that Jerry demonstrated proportional flight in 1958, and this shows that his work with it began well before that. The method Jerry used isn't known; has anyone any details?

Analog systems were very successful in those early days. Space Control was the first offered, and this was followed by Sampey, Citizen-Ship and Orbit. I hear that Space Control was developed by a high-tech electronics corporation and that Herschel Toomin was perhaps the chief engineer. Of course, Zel Ritchie took over later, and he promoted it throughout modeling.

The credit for the digital concept seems to belong to Don Mathes who worked with several R/C outfits. Somewhere along the line, Doug Spreng joined in, and the two of them collaborated on many early developments.

Most pioneers wanted just to promote R/C and had little thought of personal gain. The hobby was wavering on spindly legs, and it needed TLC! There was much sharing of knowledge, and innovators were quick to pass on their experiences to other modelers. This allowed manufacturers to progress much faster than they could otherwise have done.

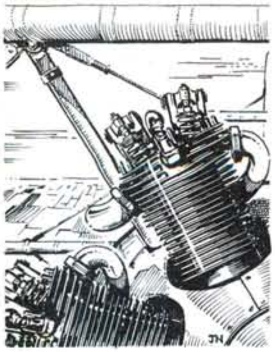
It's apparent that Howard Bonner was on the leading edge of R/C in those days. His Bonner Specialties Corp. was most successful in producing actuators, servos and other gadgets. It was logical for Bonner to see the potential in the radio field, especially when proportional development in his area indicated that a major breakthrough in R/C systems was imminent.

One of Howard's major attributes was his ability to realize that if you produce the ultimate, there's little chance that the competition will surpass you. This seems to have been his attitude when he entered the radio field, and even today, his ideals are supported by the best manufacturers.

New equipment usually begins very fundamentally, then grows and becomes more sophisticated with time. The "Concord" was conceived shortly after the Wright Brothers first flew! With this in mind, you'll appreciate the situation existing when Bonner decided to produce the ultimate R/C system. In retrospect, what's noteworthy is that his concept has evolved over the years into what today appears to be "the ultimate."

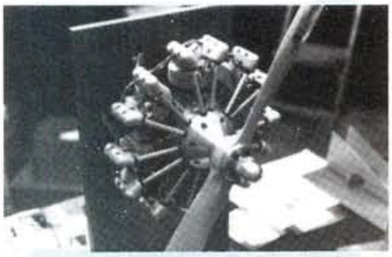
The first decision had to be how many controls or channels would be needed. There are four primary controls, of course; add to that a possible desire for retract gear, flaps, bomb drop, etc. Ideally, each would be a separate control, so if you had eight controls, who could ask for more? Next, include the desire for independent proportional action—all to be available

(Continued on page 58)



Four-Cycle Forum

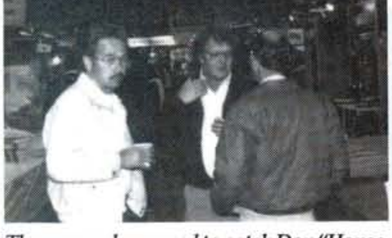
by CHRIS ABATE



Robart Manufacturing's 7-cylinder 4-stroke radial. We're talking heavy metal! Details in text.

Extra 230 was the work of Jim Van Loo and Kirk Gullach. Saito 270 will power this 1/3-scale model.

World Engine's answer to starting multi-cylinder engines. More in text. LEDs on right will light to indicate a bad plug.



The camera happened to catch Don "House of Balsa" Dombrowski talking with John "K&B" Brodbeck about a K&B .049 4-stroke. Bobby Thom has a concerned look!

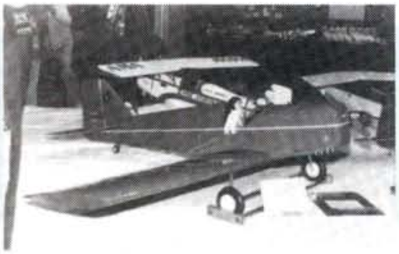
THERE APPEARS TO BE a growing number of 4-stroke-powered aircraft at trade shows. If you were unable to attend the WRAM or Toledo show, then read on (I should say, "look on"), and you'll see some excellent aircraft equipped with 4-strokers. In addition to these airplanes, I'll also discuss some new support equipment and a couple of new engines.

As far as engines go, Robart Manufacturing's* new R-780 7-cylinder radial 4-stroke is a totally awesome sight. Glow-plug ignition with pushrod-operated overhead valves, a 1.125-inch bore and a stroke of 1.125 inches gives a displacement of 7.8 cubic inches with a compression ratio of 9.7-to-1. This is all neatly packaged in a 9⅝-inch diameter over-the-rocker box and is 6¾ inches long from firewall to prop. At the time of writing, a prototype engine hasn't yet been run, but by the time you read this, operation should be a reality. Power output is still to be determined, but it's calculated to be over 10hp. I have a feeling this 7.2-pound monster will swing more wood than Babe Ruth.

Another 4-stroker that will be available by the time you read this is the new O.S.* 91 Surpass. It has a rating of 1.6hp at 11,000rpm. It's 2 ounces lighter than the old 90 and it has a new carb. It will also include a muffler.

If you already have a multi-cylinder 4-stroker or plan to buy one, a concern

Darrell Rohrbeck's scratch-design Meyers OTW-160; Saito 45 for power.



Dick Sheppard's very clean Avions Tipsy Jr. II; O.S. 120-powered.

will be how to get power to each cylinder to ignite the glow plugs. If you're wondering how to do this, World Engines* has a nice little unit that may fit your needs. As you can see, this unit will obviously make starting easier and help to keep the fires hot at lower rpm. One amp of cell capacity will run five plugs continuously for 10 to 15 minutes. The manufacturer says that two sub-C Ni-Cds will last for 12 to 20 minutes. Using a "Y" harness, the system is installed in parallel with the throttle servo. The unit has neutral adjustment, throw reversing and LED indicators that make everything easy to adjust and set up. Five leads are set up on a terminal block to indicate a bad plug with a glowing LED, which is an optional add-on.

A new kit caught my eye; Robbe Model Sport* has designed the Supermax, which is intended for the .45- to .60-size 4-strokes. The wingspan is 54 inches, length is 43 inches, wing area is 545

Larry Weimer modified an Aero Master and produced an Aero Bipe; O.S. 90 4-stroker for power.

Robbe's new Supermax, designed with the 4-stroke in mind.

Owen Wysong's 23½-pound scratch-built Sea Horse took "Best of Show" at Toledo. An O.S. 240 twin pusher used for power; absolutely beautiful. Full-size aircraft under construction.

square inches and gross weight is approximately 5.5 pounds. The kit has a prefabricated Plura fuselage, a vacuum-formed cowl, a sheeted foam wing, pre-shaped wing leading edges, machined balsa tail surfaces and a multicolored self-adhesive trim sheet.

I like the increasing popularity of 4-stroke-equipped aircraft at trade shows and competitions and I hope you will too!

"Best of Show" at Toledo was won by Owen Wysong with his scratch-built ¼-scale 23½-pound Sea Horse. Power is an O.S. 240 4-stroke—what else!

**Here are the addresses of the companies mentioned in this article:*

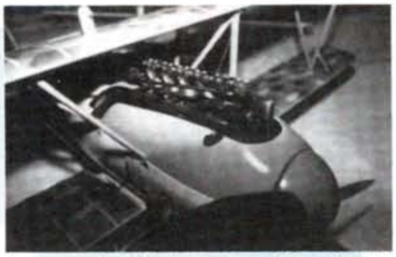
Robart Manufacturing, 310 N. 5th St., St. Charles, IL 60174.

O.S.; distributed by Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

World Engines, 8960 Rossash Ave., Cincinnati, OH 45236.

Robbe Model Sport, 180 Township Line Rd., Belle Mead, NJ 08502. ■

A Saito 270-powered Bartles & James sport bipe by Robert Benso.



Four-strokes have a way of blending in with scale engines, as can be seen on Tom Polapink's Albatross OVA; Saito 1.20 4-stroke.

WACO YMF 5 by John Buckley. Coverite and aluminum plate over balsa; O.S. 90 4-stroke for power.

Edward Mitchell had a very clean Zlin Akrobat Special, powered by an O.S. 1.20 Surpass.

Aeronca LC with an O.S. 1.60 twin was done by Fred Palermo.

DAVEY SYSTEMS

CALIPH

SPECIFICATIONS
Type: *Sport, intermediate*
Span: *48 inches*
Weight: *2¾ pounds (with O.S. 20 4C)*
Area: *390 square inches*
Wing Loading: *18.5 ounces/square foot (as tested)*
Power Required: *.15-.20 2-channel; .20 4-channel; or .05 electric*
Number of Channels Required: *Minimum 3*
Suggested Retail Price: *$47.95*
Features: *Simple, all-balsa construction. Wide variety of powerplant choice, including electric.*

TWO-STROKE, FOUR-STROKE, OR ELECTRIC... YOUR CHOICE, YOUR PLEASURE.

by STEVE SCOTTO

JUST WHEN YOU thought everything in R/C was getting bigger, faster and slicker, guess what happened? Along comes the Davey Systems* Caliph. This bird sports a modest 48-inch wingspan and lines as square as Lawrence Welk. Take your choice of silent electric power or internal combustion, 4-stroke style, and you might just have the most neighborly aerial fun machine available.

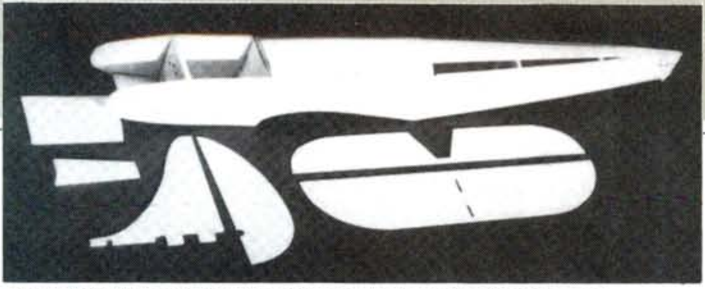
Who needs this plane? Maybe you're tired of seeing the same fire-breathing monsters burning holes in the local sky. Looking for a different challenge? Instead of the fastest, tightest, hardest-cornering pattern around, try slow, low and graceful. Sounds dull? Try it some day! It ain't so easy when the *pilot* does the flying, *not* the speed of the airplane.

CONSTRUCTION: The Caliph's construction is as old-fashioned as it comes. It's all balsa, with a few ply and spruce parts to lend strength. The kit gives the

Over-the-wing peek at O.S. engine.

Hallco gear appears to have picked up some camber along with the toe-in Steve added!

Photos by Rich Uravitch.



Everything here but the wing. Simple sheet construction is a snap.

builder a choice between 3- or 4-channel guidance. Have an 05 electric power system looking for a home? Try it here. If 4-stroke is more to your liking, the plans show the installation of both the HP-21 and the very popular OS FS-20. The 2-stroke true believers can install any .15 through .19 engine.

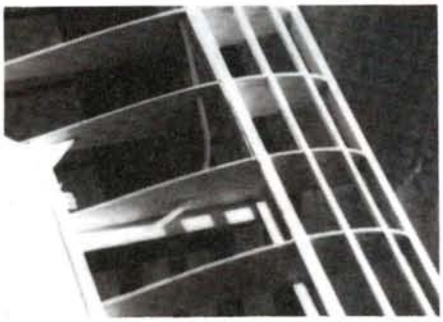
The O.S.* 20 4-stroke got the powerplant job in this model. This is a little gem of a motor, and it's sure to surprise and delight anyone who sees it in action. Mine is running like a clock with a 9x6 prop and 10 percent nitro fuel.

Construction begins with the wing. The plans give details for 3-or 4-channel operation, and I opted for 4-channel guidance. All the parts needed to install the ailerons are included. Wing construction is the traditional stick-and-tissue design; CA and MonoKote greatly speed the construction process.

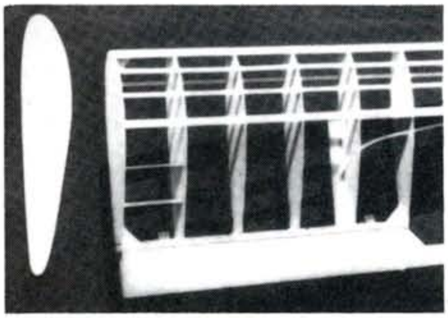
The prominent tip plates are unique to this design. The theory behind these plates? Full-scale biz-jets have sprouted tall wing-tip-mounted fins to control the drag-producing vortices created in the subsonic flight envelope. Some of the more familiar single-engine planes have added drooping "Horner" wing tips in an effort to create better airflow around the end of the wing. Do they work on the Caliph? At over 30mph, the effect may be hard to measure. Try them; if you like them, it's something new to lecture the others at the field about.

The fuselage is a basic model airplane box. It's a nice square box, with a hint of a curve on top, but don't let that fool you. It holds the engine to the wing and tail all right, but don't look for beauty here. The plans show mounting options for gas or electric motors. I used an O.S. aluminum mount, and it works like a charm. The fuselage accommodates a 2-ounce tank; this isn't very big, but the .20 drinks fuel so slowly that flights of 8 to 10 minutes are possible.

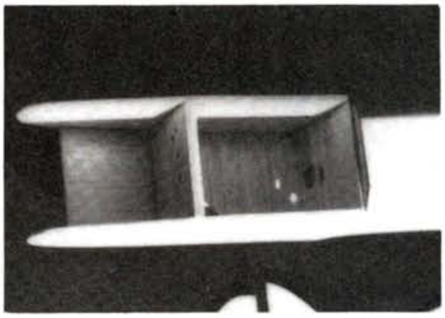
I made a few changes in the landing gear. The supplied wire main gear is really designed for electric flight. I didn't think it could withstand the stresses of gas flight and the paved runway I fly from. Hallco aluminum mains with Dave Brown* foam tires are the landing gear of choice. A Carl Goldberg* tail-wheel mount was used to hold a piano-wire axle and a ¾-inch wheel.



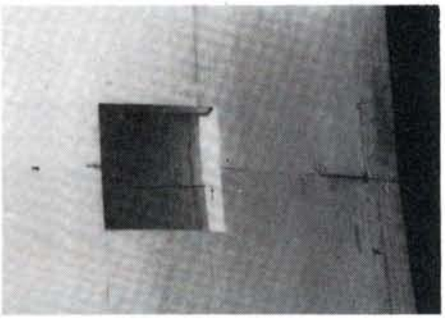
Section of wing showing conventional structure and aileron pushrod conduit installation.



Wing tip and spill plate. Note stiffeners between tip and adjacent rib to prevent covering from distorting tip.



Nose section: firewall and fuel tank compartment.



Wing center-section with servo cut out.

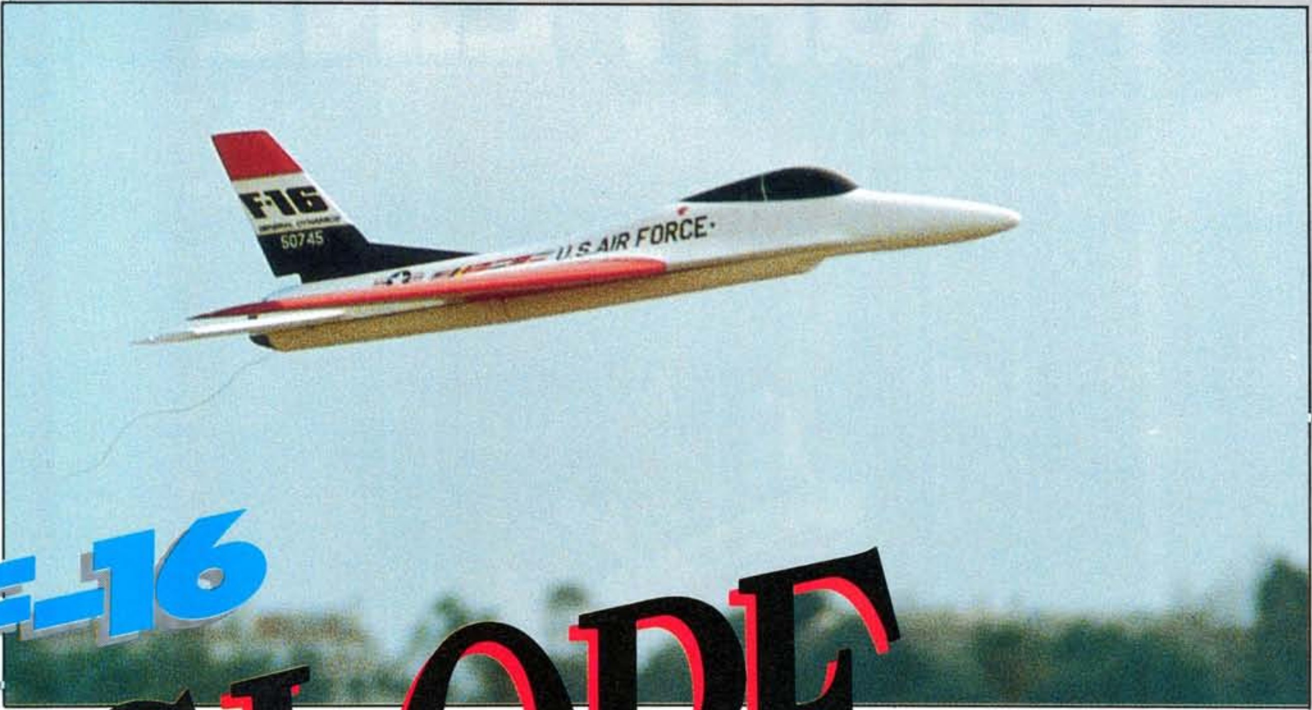
Tail feathers are simple sheet balsa. Sand them, round the edges and cover them. I used the very light, very thin Radio South hinges to join the moving surfaces. These hinges are almost paper thin, yet work well. Glue them in securely!

Radio installation is conventional; I used a 500mAh battery and bantam-size servos. It's a little tight in there, so plan your installation carefully.

Itching to get flying? Don't skip any steps in final assembly and covering. Good ol' MonoKote was the covering chosen, and the pattern was inspired by the prewar Army paint scheme. The decals were the self-stick variety from Major Decals*. The front end was relatively heavy, because of the beefed-up landing gear and 4-stroke engine, and about two ounces of lead was glued in under the tail to achieve balance.

PERFORMANCE: Even though the Caliph is a low-wing model, it's extremely docile. With a wing loading of 16.5 ounces per square foot, turbulated airfoil and a generous tail moment, this should come as no surprise. With a little toe-in on the main landing gear, the model tracked very well during takeoff runs and, in spite of being a tail-dragger, lacked any tendency to ground loop. Scale-like takeoffs are fairly simple with the Caliph. However, this light model does get airborne immediately, especially if

(Continued on page 74)

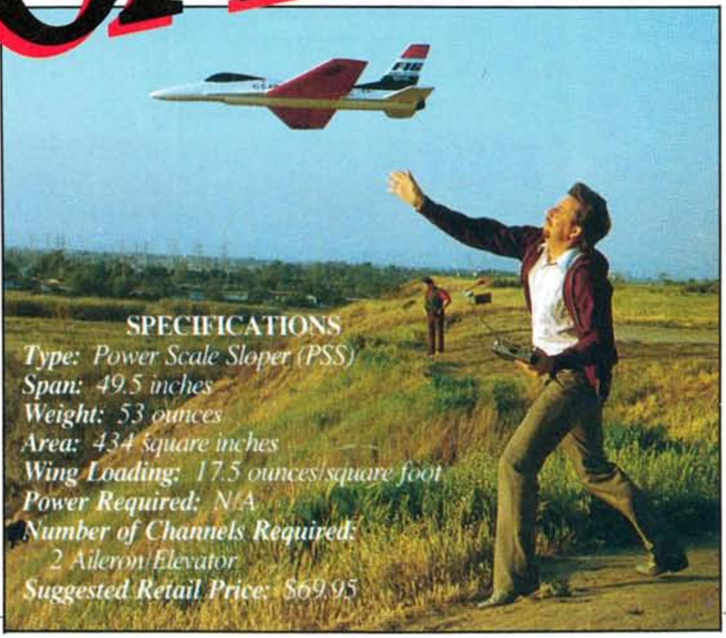


F-16 SLOPE SOARER

by JOHN LUPPERGER

POWER Scale Sloping (PSS) is very popular in England, and it's starting to catch on here. An occasional scratch-built model would show up on the slopes, but only recently have kit manufacturers taken notice of the new soaring activity. Combat Models* is a new company with a novel approach to soaring. Its F-16 fighter is an all-foam model that allows the PSS enthusiast to get in the air quickly, with little effort and minimum financial outlay. Since jets have no props, the model looks very realistic in high-speed flight across the face of your favorite slope. Although by no means exactly to scale, the F-16 does give the appearance and general feeling of flying a high-performance jet fighter.

Six foam parts make up the model; all are protectively wrapped in thin foam for



SPECIFICATIONS

Type: *Power Scale Sloper (PSS)*
Span: *49.5 inches*
Weight: *53 ounces*
Area: *434 square inches*
Wing Loading: *17.5 ounces/square foot*
Power Required: *N/A*
Number of Channels Required: *2 Aileron/Elevator*
Suggested Retail Price: *$69.95*

ALL-FOAM PERFORMER WILL HAVE THE COMPETITION "CHECKING SIX"!!

Field & Bench Review

shipping. The hardware and few wooden parts were bagged and easily identified. There are no plans, as there's virtually no building involved. It's an "assemble-and-finish" process. The foam components are molded in high-density (about 4- to 4½-pound) foam, which is much stronger and heavier than is usual with foam-molded models.

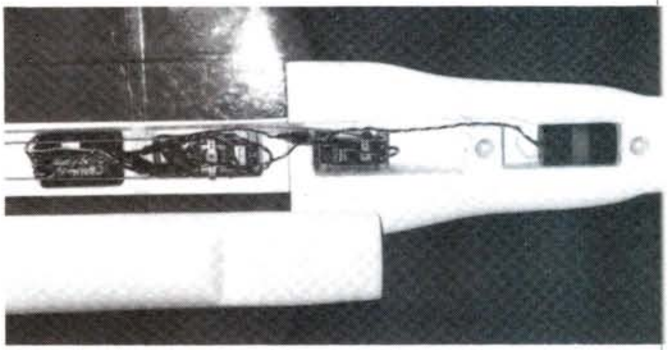
The six-page instruction booklet has three pages dealing with model assembly, a few line drawings that clarify some of the assembly steps and a page of line drawings showing some basic military combat maneuvers.

CONSTRUCTION: Most of the work concerns the finish and the radio installation, as there's very little building to do. The first step is to sand the entire model to remove all the mold flash and air-outlet nipples. All parts are then checked for fit and sanded as necessary. The manufacturer recommends that the fuselage be filled with thinned-down Model Magic filler, sanded and then painted. I wanted a stronger surface finish, so I covered the model with medium silkspan, which I applied with thinned-down alphatic-resin glue. This not only filled and smoothed the surface, but it also allowed me to use Pactra* Prep primer without melting the foam. The fuselage was sprayed with gloss-white Formula-U, and the canopy was brushed with high-gloss black Formula-U. With this technique, I was able to get a very smooth, good-looking finish, but I subsequently discovered that this probably wasn't worth the effort. (More on this later.)

The next step was to put a span-wise strip of strapping tape across the wing at the CG location for bending loads. There are no spars, and the tape adds a lot of strength for aerobatics. The wing, tail surfaces and bottom hatches were then ready for covering. I used Flite Kote* on all the surfaces, because its low-heat application won't ruin the foam parts. Even so, it's important to regulate carefully how much you heat the surface of the foam parts. If heat is applied for too long, so heating the foam too much, the foam expands, and this causes the surface to "bead up."

Using epoxy, the torque rods for the ailerons and elevators are glued to the wing and the horizontal stab. On a flat surface, the wing is then epoxied to the fuselage with the tips raised 4mm (approximately 5/32 inch). The horizontal and vertical stabs are then epoxied into their appropriate fuselage slots. The balsa ailerons and elevators are then glued to the wing and stab using the supplied hinges. Next, the aileron servo is mounted in the fuselage and hooked up to the aileron torque rods. The recommended travel is ½ to ¾ inch up and down. I suggest that you set the ailerons up for the maximum throw, especially if you have a radio with dual rates. When you've expoxied the rear hatch into place, it's nearly impossible to change the position of the aileron horns.

The three bolts for the front hatch are put through the hatch and the nuts put on with a couple of turns for positioning. A very small amount of epoxy is used to position the nuts in their recesses, with the hatch used as a guide. The hatch is then removed, and the nuts securely glued to the fuselage. With the front hatch screwed in place to act as a guide, the rear hatch is epoxied to the fuselage. The elevator servo is then mounted to the fuselage and the elevator hooked up. There's no pushrod supplied for the elevator; I used a cable-type, although any slightly flexible pushrod or nyrod could be used. The final step is to put strapping tape on the nose and bottom hatches to protect the fuselage while landing. The model balances 4¾ inches back from the leading edge at the fuselage/wing joint. It only took two ounces of lead to achieve proper balance.

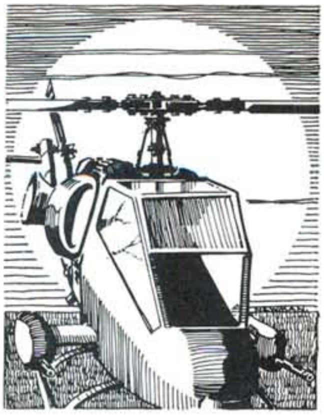


Radio compartment with hatch removed. Molded foam provides nice compartments, insulates components.

FINISHING: Most of the finishing is done during construction. The F-16 is flown in many countries and can therefore be finished in a variety of striking color schemes. I decided on the basic red, white and blue General Dynamics prototype finish. Apart from those on the rudder, there are no marking decals supplied with the kit. I purchased a set of the Pilot F-16 decals and applied them to the model. Their scale was a little off, but they were just what the model needed for that finished look. Now that I've flown the model, I think I'd do the next one in a flat camouflage finish, which would be easier to maintain. Slope models take a lot of abuse, and they constantly need touching-up. This is why I wrote earlier that all the work I put into the finish just wasn't worth it!

RADIO: My trusty Cirrus* 7-channel AM radio provides the guidance for my F-16. This radio is several years old, but it has always been reliable, and this is important with close-in slope flying. I used the standard S-28 servos and a 500mAh battery pack.

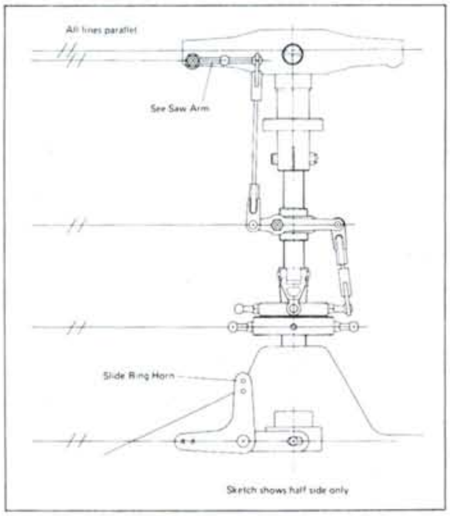
(Continued on page 105)



Helicopter Challe

by CRAIG HATH

I'VE NOTICED SOMETHING that's pretty important to those who are just diving into the world of model helicopters. Based on observations and conversations with people who are trying to solve problems, I say that the most confusing area of any helicopter is the tail rotor. For example: There are machines that lift into a hover and then immediately start to spin wildly; others lift off and all is well until some sort of correction is needed, and the result is then anything but predictable! The ensuing confusion is often compounded by oversights on the part of the experienced flier who is supposed to be helping the hapless newcomer. One fellow told me that when he asked his "instructor" to help stop his machine from spinning in circles, he was advised to purchase an entirely new aftermarket tail-rotor drive system. I had to ask if he was trying to pull my leg, as



The proper way to set the collective linkage to the dead neutral position. Notice that the mixing arms, swashplate and see-saw arms are all parallel.

surely, none of the kit manufacturers produces a model that won't do a fairly reasonable job of controlling the tail rotor right out of the box. Of course, some improvement may be possible, but the stock setup will usually function quite well.

What really bothers me is the thought that many potential fliers have been scared away by the confusion usually associated with the tail rotor. Further, how much time and money has been wasted on gadgets and theories when the real problem was a set of tail-rotor blades installed backwards? If it sounds as though I'm on a soapbox this month, *I am!* If any of you out there are actively involved in helping beginners, please be sure to take a few extra minutes to look over any machine that displays problems like the ones described. Remember that newcomers who need help are often very impressionable and easily discouraged. This aspect of radio control is quite technical and may be difficult to communicate simply, but give it your best shot.

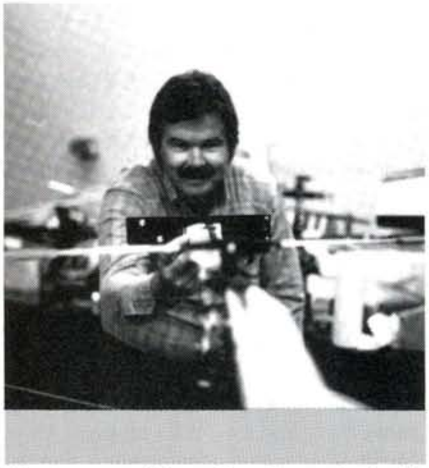
Finally, let's review a couple of points about tail-rotor control:

- Always turn the rotor head in the usual direction of flight, and confirm that the tail-rotor disk turns in the proper direction.
- Be sure to study the instructions for your particular model, check for correct installation of the tail-rotor blades, and be sure that the linkages which actuate the pitch control are connected as shown.

These seem to be the most common mistakes that foul the tail-rotor system. I'll have more to say on the basics of tail-rotor pitch control in a future article. For now, I'll continue with the set-up for the ideal helicopter that we've been working on for the past few months.

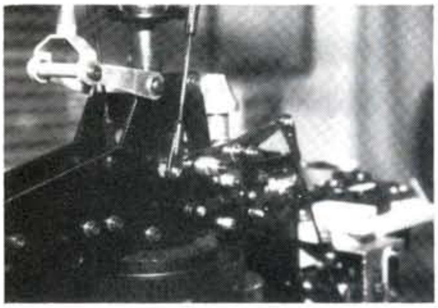
Dialing-in the collective pitch control on a model helicopter can be as individual a process as getting a haircut. Many factors that alter the sequence come into play. One logical approach to setting up the collective pitch is to begin with the simplest form and then look in detail at some of the finer points and options.

To begin, get out your handy instruction manual and study the details of the collective pitch-control system. Be sure



Here's your smiling author demonstrating his technique with the precision pitch gauge. Take the time to sight the top of the gauge with the flybar. Try double-checking yourself when performing this task; you might find that you have overlooked something.

that the linkages operate freely with no binding or excessive sloppiness. If you encounter either of these symptoms, you must correct them before attempting to continue. Any binding is especially unacceptable, as it may result in a very unstable flier. A "sticking" collective system makes flying difficult, because the amount of control movement required to overcome the tight spot is usually much greater than that which would be necessary for the effect you're trying to achieve. You'll have a helicopter that jumps up



Here is the dead neutral setting for a GMP Cobra. Notice that the front of the lever arm is swept upward, and that the rear of the arm sits in the center of the openings in the main frames.

nge

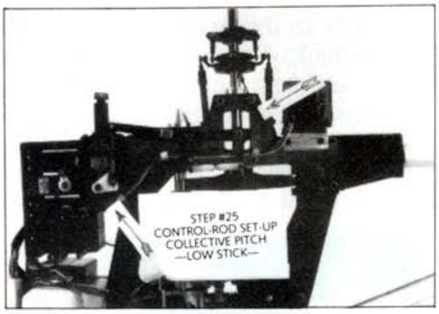
and down and never really settles into a steady hover. The effect of "slop" is similar, but the helicopter feels somewhat "dead" at the current control setting, and seems to be sluggish when responding to control changes. Whatever the case, fix it; you'll be glad you did.

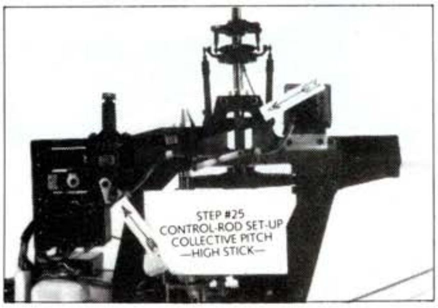
Regardless of your flying style or type of radio, collective pitch set-up begins in the middle of the throw. In other words, with one key exception, set up for inverted flight at the hover point. For now, we won't concern ourselves with that, but we'll work toward accomplishing a good all-around setup for normal flying. If you know the exact hover pitch for your machine, this will save time and guesswork at the flying field. If you're unsure of the ideal hover pitch for your helicopter, either follow the manufacturer's suggestions, or start in at around four to five degrees.

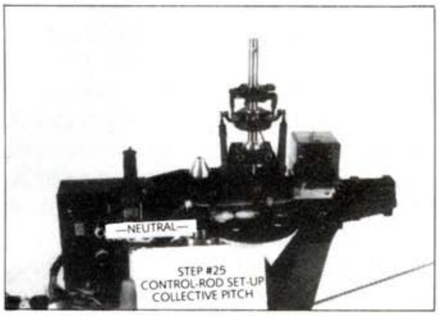
Before you can accurately adjust the collective pitch, you'll need to obtain a precision pitch gauge. Buy or borrow one—but get one! Set the gauge to the desired hover pitch, and then set the throttle/collective stick to exactly the halfway or middle position. Now adjust the pitch of the rotor blades so that they agree with the setting you selected on the pitch gauge. This will be your hover pitch, and from this we'll begin to build the rest of what we'll call the "pitch curve."

The pitch curve for your model will vary, depending on your level of flying competence and the type of flying that you do. For example, if you're just beginning, you'll need a pitch curve that will be as forgiving as possible: about one degree of positive at the bottom, and around six degrees of positive at wide-open throttle. The effect of this setup would normally be that the helicopter would climb gently and descend gently, even if the throttle stick is nervously moved to the extreme end of its travel in either direction.

Since most of you are probably beginners, let's cover the previous point in a little more detail. Setting the collective







These photos show the full range of collective pitch control for the GMP Stork. Setup is typical for most lever-arm-actuated pitch linkages.

pitch curve to the manufacturer's will usually give you a machine that will perform unacceptably for most conditions. The manufacturer doesn't have the last word in pitch-curve settings. Your helicopter might be an alternative type of engine, you may in a high-altitude area, your fuel could be different; I could go on, but I'm sure you get the picture. Usually, when you're just starting, you should tone down the helicopter as much as possible, while still retaining good controllability. You should usually set the hover pitch at a point where the rotor speed will be at the lower end of the range recommended by the manufacturer, i.e., 1,400rpm to 1,600rpm; set the hover pitch higher to get the rotor speed down around 1,400rpm.

From this point, you should leave some positive pitch in the rotor disk, with the throttle stick all the way down to idle. This will allow the helicopter to "float" down when ever the stick is sharply reduced (due, for example, to frazzled nerves!). In the reverse, if you set the upper end so that the total pitch at full throttle is fairly low, the machine will generally climb slowly if the stick is sharply increased. Notice that if you set your machine up so that there's very little change in pitch from hover to full throttle, the engine will tend to rev very high under full acceleration. Try not to make a habit of opening the throttle fully, as this may cause the rotor to over-speed and so damage the mechanics or engine.

All of this assumes that you have the luxury of being able to adjust the pitch curve by adjusting the transmitter. If you don't have this adjustable pitch-curve feature, you'll have to wait until *next* month when I'll get to the details of differential throw.

One final note about the trainer setup: As your skills improve, be sure that you open the pitch on both ends a little at a time, and *never* attempt to enter the helicopter into forward flight, as you'll have a heck of a time landing it!

That covers it for now. Next month, in our helicopter special issue, I'll take a look at some more advanced setups and begin a discussion of the uses of the special built-in helicopter radio features, which are becoming so popular today.

Small Steps

by RANDY RANDOLPH

THERE'S GOOD NEWS for those of us who like small airplanes: Cox* has just announced the introduction of a new .074 engine that's complete with a throttle that really works! I hear that the prototypes are living up to expectations in a big way. Production is still a few months away, and it will take some time to fill the distribution pipeline, but the new Cox engines should be available this fall.

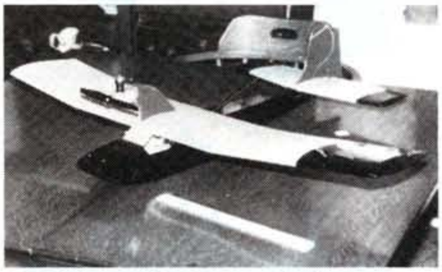
• Time passes all too quickly, and it won't be too long before the non-flying season is with us again. The winter months give us a chance to charge our batteries for the last time, give our airplanes a really good cleaning, fix those "temporary" repairs that were made last spring and clean off the bench to do the building we've been thinking about. But why not get ready *now* for some different flying in the non-flying season? Picture No. 1 isn't a seaplane! John Vasey in Austin, MN, has some interesting things to say. John writes:

"...I'd been flying a Falcon Jr. with no landing gear, in the snow. In soft snow I had trouble with the snow packing in around the engine. The picture shows my solution.

"Although it doesn't show too well in the picture, the lower fuselage is just one big 4-inch-wide ski that goes back from the nose to just aft of the wing trailing edge. The wing is two 14-inch tip sections of a broken Falcon Jr. wing with a 14-inch built-up center section, making a total wingspan of 42 inches. It would take off from firm snow and fly quite well if the angle of attack was kept reasonable. However, at high angles of attack, that big flat ski killed off the speed too quickly, so it was cut down to just fuselage width and the airplane hand-launched. Performance was much better.

"I like a small, easily transported plane for winter flying. I put it in the car, and when I find a good snow-covered field I just start the engine and throw. In the past five years, I've flown during every month but one! Although I fly an 8-foot Keil Kraft Falcon and .60-size pattern airplanes, I still like the little ones."

Those of us who live in the Sunbelt never think of flying on snow, as we just don't see that much. However, John's airplane looks enough like a flying boat to suggest that we should try "float" planes on snow—the next time some comes this way!



This isn't a seaplane! See text for the true story of John Vassey's airplane.

• The next letter comes from Nevada City, CA. Harry Stewart shares a little information about his .15-powered bipe in Picture No. 2.

"...I've never thought that small size means that you have to settle for small performance. With that in mind, I designed the Baby Bipe. It only spans 32 inches, but the most frequent comment is that it looks much bigger in the air! It's powered by a .15, weighs 29 ounces, takes off and lands very easily and is very aerobatic in the air because of the approximately 12-ounces-per-square-foot wing loading."

That's a good-looking airplane, written up by Harry as a construction article in the May '88 issue of *MAN*. It falls right between Joe Wagner's "Osprey" and Ace Radio's "All Star"—good company!

• While we're on a roll and talking about good-looking airplanes, here are a few words from Canada's Ray Gareau. Ray has been at this business of "compact aircraft" for a long time, as shown in Picture No. 3. He has more to say about throttles... and other things:

"...Your comments about Tarno carbs bring me to this effort. You think that because it isn't an IHI (In-House Invention) it has to be very poor in performance, or no good at all. Just be honest and ask Art Schroeder. He's had one for more than ten years, and when he first flew it, he was so pleased with it that he mentioned it in many of his columns."

Ray has me all wrong; I'm not "down" on Tarno carbs. They work well, but only in conjunction with a muffler. Cox engines allow the crankcase to breathe through the exhaust ports when the piston is at top dead center and without a muffler (which tends to keep a fuel-air mixture around the exhaust port). The engine goes lean as the intake is restricted by the changes in throttle settings toward idle.

Ray continues: "... The picture is of two planes that have been flown with the Cox TD .049s, Tarno carbs and Cox mufflers. The four-engine job has been flying for about eight years, and very rarely did one of the engines stop (unless it was out of fuel). Some will say that you need a lot of patience to operate a four-engine .049. I think not; it only takes an established starting procedure. At first, I was using a tachometer to make sure that all the engines were in sync, but after a while I was able to make the adjustment by ear. This proved to be in the neighborhood of 14,500rpm at full bore.

Even with four engines, that big job has a total engine displacement of less than .20.

"Needless to say, this plane, with four engines humming, flies like a pattern plane. It will loop, roll, do figure 8s and split Ss, all the while using the throttle just as in pattern flying. The only problem is that when you're flying it, you enjoy yourself so much that before you realize you're out of fuel, one engine is 'out.'

(Continued on page 52)

Field & Bench Review

GM PLASTICS F4U CORSAIR

Fantastic Plastic Bent-Wing Bird!

by MIKE LEE

Above: *Intrepid duo, Danny Gayhart and Mike Lee, smile confidently after the Corsair's initial hop.*
Left: *Rick Giannini's lens captures the big bird on takeoff roll.*

WARBIRDS TEND TO bring out the best in airplane buffs. No conversation about warbirds would be complete without including the big birds from World War II, and one of the most popular is the F4U Corsair. Part of the legend of this bent-wing bird are the familiar gull wings that provided ground clearance for the huge prop. The Corsair epitomized the long-standing racing axiom that there's "no substitute for cubic inches." Its P&W R-4360 "Corn Cob" engine (on the final version) was even bigger than the earlier Corsair's R-2800!

Fame and infamy often make for popularity, and this is true of aircraft replicas. The latest scale replica—the Corsair—comes to us from GM Plastics*. The Corsair is modeled after the more popular F4U-1D version of the Corsair, which was produced in greater numbers than its other versions. The Corsair has a fully molded ABS plastic fuselage with installed firewall, foam wings, and built-up tail feathers. To greatly ease the chore of building the famed bent wings, GM has made ABS gull wing-joints.

Type: Large Sport Scale
Span: 71¾ inches
Weight: 14 to 16 pounds
Area: 920 square inches
Wing Loading: 35 ounces/square foot (at 14 pounds)
Power Required: .80-1.08 2-stroke; 1.20 4-stroke
Number of Channels Required: Minimum 4
Sug. Retail Price: $279.95
Features: ABS fuselage skins, over crutch; foam wing cores with plastic gull section; complete hardware package.

CONSTRUCTION: I started with the wings, which are foam cores cut with a hot wire and made in four different sections. There are two inboard and two outboard sections, with the very center and the gull portions left wide open.

Assembly begins with the wing spars. The spars are a network of two main spars and several plywood false ribs. When assembled, this spar assembly is the very crutch of the wing and is everything to wing integrity. Make sure that this assembly is very straight,

and when this is done, go on to the foam wing sections.

The wing sections are already cut to accept the wing spar assembly. However, there are a couple of cuts you must make in order to properly place the aileron pushrods. Cutting is done with a long drill bit or the sharp end of plastic pushrod tubing. When these cuts have been made, fit the cores to the spar assembly, making sure that they will fit correctly. The next step is sheeting the wing, and I used epoxy to adhere the wing skins in place.

When the wings have set, attach them to the spar assembly. The wings must be straight and well-smeared with epoxy. This is a critical step. Let the epoxy dry, and then go on to the short cut.

The short cut is GM's unique plastic gull sections. These are pre-shaped, requiring the builder to simply cut them out to fit and adhere in position on the wing. Voila! Instant gull wings! The center section is left open on the top, and the bottom comes later. From here, ailerons are cut away, along with the

landing-gear doors. The ailerons require some additional finishing, but should pose no problem.

When I mated the wing to the fuselage, I was pleasantly surprised to find that the wing fit exactly to the saddle. The instructions even mentioned matching the contour, but that wasn't necessary. The belly section of the fuselage has to be cut away to fit the wing. Once fitted, the cut-away part becomes the belly pan. This makes it all come together neatly, and the Corsair really starts to take shape.

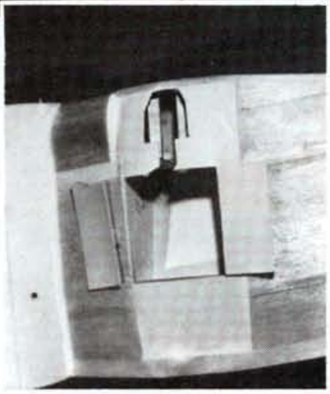
The wing is located with dowels at the leading edge and attached with two nylon bolts at the rear. The belly pan neatly keeps the bolts captured inside the wing, so you shouldn't lose the bolts during transport. Now to the tail.

The tail is a built-up affair, starting with the horizontal and vertical stabs. These units are simply sheet balsa with internal ribbing. They are strong, but light to reduce tail weight. The horizontal stab is then mounted to the fuselage. I thought I was going to have trouble here. The stab remains in two pieces, being mostly butt-glued to the fuselage. There is, however, a spar which joins the two halves, and this runs clean through the fuse to join the halves. This is another critical joint, but if done correctly, will provide all of the required strength to the horizontal stabilizer. The vertical stab is butt-glued to the top of the fuse, using just a little of the rear post to help hold it in place. So far, I've experienced no stress-related problems at the tail joints.

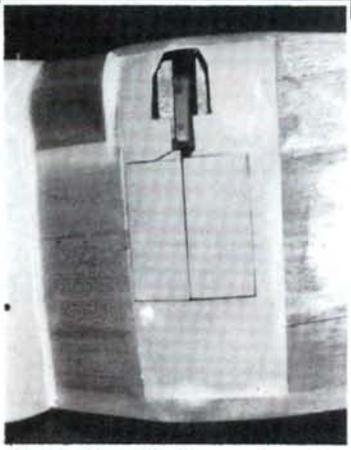
The rudder and elevators are completely built up and have external ribs that create the scale-like appearance of the tail parts. The way the rudder is actuated from inside the ship gave me a touch of heartburn, as it uses a torque rod similar to a strip aileron. This unit has no trailing edge to support the length of it, like the aileron, and I felt it was a bit sloppy. A single bearing brace was installed at the bottom of that rod to keep the poor thing from twisting away.

To maintain the scale looks, the elevator was also actuated from inside the ship. The two elevator halves are on the same torque rod, so make sure that both halves are even before you seal everything with epoxy.

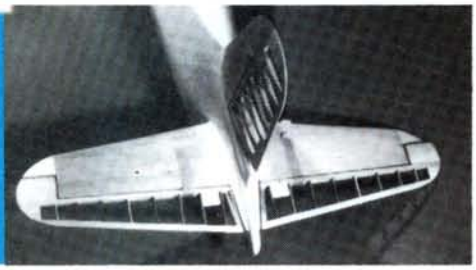
(Continued on page 107)



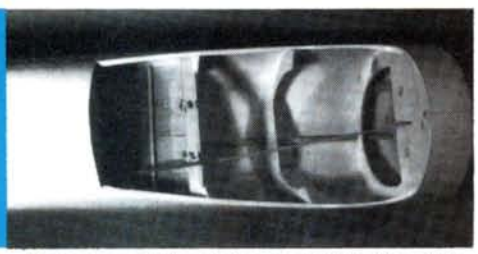
The right wing landing-gear bay with the gear doors removed and the gear blocks in place for the Rhom-Air retracts. Note that this section is the ABS-covered section, making the landing-gear installation easy.



Same wing with the gear doors in the closed position. This nicely cleans up the huge holes and allows more speed.



The tail assembly of the Corsair reveals the ribbed flying surfaces that reproduce the scale lines of the bird. All-balsa assemblies are solid, despite suspicious method of attachment.



The cavern which makes up the interior of the Corsair. The ship's ABS plastic fuselage provides an enormous amount of space for radio installation.

The wing center section shows the open bay for equipment. Bottom of wing is covered by an ABS fairing, as are the gull bends of the wing. Note the large double spars.

SMALL STEPS

(Continued from page 46)

Everybody should have a bi-plane. This one for .15 power looks like a winner. Not many kits for this size airplane around!

However, even with two engines out, it still flies well. I even took off and flew around for a while with only two outboard engines running. It's a great show-stopper.

"The other plane was built on a day when it was too cold to fly. I found a set of foam wings from an old Cox CL plane (Chipmunk/ME-109?). I removed the tips, replaced them with very soft balsa and made a 3/16-inch center rib to establish dihedral when they were joined. The fuselage and tail section were built with quarter-grain light balsa. The fuselage sides are of light 3/32-inch sheet, and the landing gear is 1/16-inch sheet aluminum screwed to a hardwood bar across the bottom of the fuselage. Covered with Solarfilm, it weighs 12 ounces with a 4-channel, micro, Logitec radio and a 100mA battery pack. Club members who've seen it fly say that I'm the only one who can fly it! It's fast, and with a 27-inch span and a 6-inch chord, it's so small that it flies out of sight very quickly. The general layout is something like a helioplane, and it flies with wings at zero and just a touch of right thrust."

I'll bet that there are many U-control airplanes that could be, and have been, converted to "our" size airplanes. I know that a lot of the scale free-flight models offered by Flyline Models* and others can be very successfully converted. How about you; how did *you* do it?

Next time, I'll try to look into a little more of the aerodynamics that affect the flight of our smaller birds, and I'll discuss how we can predict performance before putting razor to wood…

**Here are the addresses of the companies mentioned in this article:*

Cox Hobbies, 1525 E. Warner Ave., Santa Ana, CA 92705.

Ace R/C Inc., 116 W. 19th St., Box 511C, Higginsville, MO 64037.

Flyline Models, 10643 Ashby Pl., Fairfax, VA 22030.

SKYDART

(Continued from page 24)

PERFORMANCE: Before flying, check for the correct CG location, and check the rudder and elevator throws. Select a suitable propeller. If a reed-valve engine is used, a tractor ropeller mounted backwards (when looking at the front of the engine) can be used, and the engine is run backwards. If a Tee Dee* engine is used, a pusher propeller is needed, since these engines won't run backwards. Again, the propeller is mounted backwards when looking at the front of the engine. I recommend that a 5½x3 or 5½x4 propeller be used for initial flights.

At the field, be ready for questions and comments like the following: "Hey kid, when are you going to start flying *real* airplanes?" (As if this particular model airplane is a mere toy and the questioner's purple Ugly Stick isn't.) "Does it fly?" "Where's the landing gear?" "Which side is up?" And the question everyone asks,

(Continued on page 58)

Ask the man who owns one!

Vic Wiss with his Sport 500 helicopter.

We asked Vic Wiss to assemble a Sport 500 helicopter. Vic is Service Advisor with an auto dealer here. He has flown helicopters for about two years and has gotten pretty good at it.

Sport 500 is easy to build

Vic got his Sport 500 kit on a Monday and had it ready to test fly on Friday. It took him about 20 hours to build it. He put an RC airplane type Enya 45 in it, installed a 4 channel aircraft radio, and used a gyro to stabilize the tail rotor — no special helicopter type equipment except for the gyro. The first Sport 500 sample kit came in from England by mail and was missing four screws. Except for these screws, all the parts were there. Vic has experience with helicopters and disagreed with the positioning of the control rod (in Step 17). He would have mounted it to the aft end of the chassis instead of to the boom, but he went ahead and mounted it the way the instructions called for. This was minor and Vic said that Sport 500 was one of the best RC helicopter kits he had ever built regardless of price.

An audience for the first flight

After breaking in the engine over the weekend and making sure that everything worked and balanced OK, Vic brought the Sport 500 to Hobby Lobby during his lunch hour on Monday. He got all of us out to the parking lot and started it up. This took guts — most of us test fly our airplanes privately and don't ask for an audience until we know the things fly! To make it a bit more exciting there was a gusty wind blowing.

Vic pushed the throttle and Sport 500 lifted off and then hovered. A few moments later he flew it forward and into a climbing turn for a fly-by. The helicopter flew lightly and easily. He flew it back to our parking lot and hovered it. At this point Vic hollered to me to come over to him and I thought something was wrong. "Just my luck" I thought, "I get everyone outside here to see this and something breaks."

Why it might be the best beginner's RC helicopter ever made

I ran over to Vic. He still had the Sport 500 hovering about five feet off the ground. "What's wrong?" I asked. Vic was grinning. He said: "Look at the transmitter!" I looked at the transmitter to discover that **Vic was not holding the control sticks!** Sport 500 was hovering by itself!

This **built-in stability** is why Sport 500 is **the best beginner's RC helicopter ever made.**

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About Those Engin

by JOE WAGNER

MODEL AIRPLANE MOTORS can last a *very* long time. A few years ago, I re-acquired the Brown .60 that was my first engine way back in 1937. It was used when I bought it then, but 51 years later the Brown still looks and runs as well as ever. An old flying buddy of mine from prewar days, Phil Greer of New Castle, PA, has just managed to get *his* first gas engine back again too. It's a 1940 Ohlsson "Custom" .50, and it's also still in excellent running condition.

When these old-time motors resurfaced, they were, of course, externally dirty, with rust here and there on cylinder fins, drive washers and needle valves. But internally, everything remained in fine shape. A little cleaning up and re-oiling was all it took to make my Brown and Phil's Ohlsson just as good as ever.

I've lately encountered many old model engines that are still first-class runners. This is largely because their original owners carefully "broke them in" when they were new. Running-in a brand-new spark-ignition motor took hours, but most early gas modelers did it religiously—we knew its importance.

A properly broken-in engine is reliable, easy to start and durable. The running-in process accomplishes three things: First, it wears "high spots" off the moving parts. (These are microscopic imperfections and surface roughness that generate friction and heat and reduce power output.)

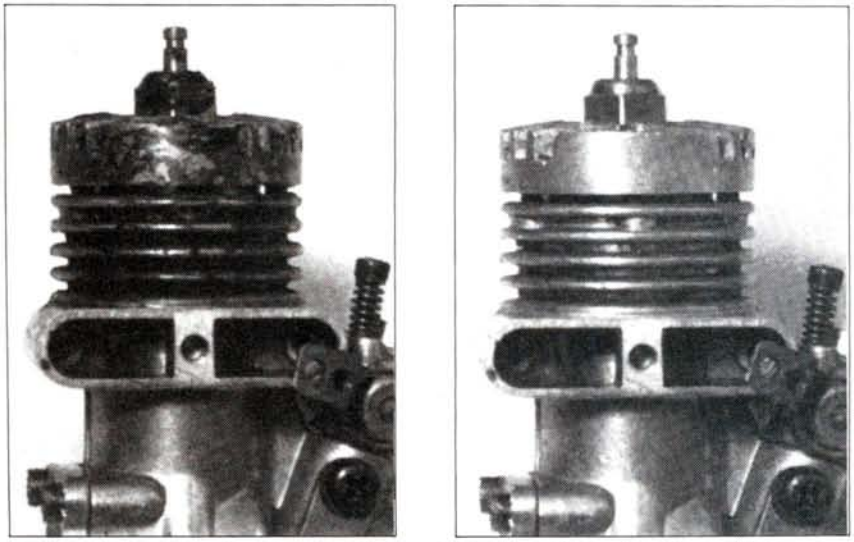
The second benefit of breaking in a motor is the "dimensional stabilization" that occurs after the cylinder and piston have undergone several cycles of being heated to their operating levels and then cooled to room temperature. Newly manufactured metal parts often contain internal stresses. When they're heated and cooled repeatedly, their stresses gradually relax, and the size of the parts changes slightly. The difference may only be measurable in ten-thousandths of an inch but, in a precision-fitted model motor, that's enough to affect its performance.

The third way in which running-in an engine helps, is a sub-microscopic re-alignment of the surface molecules of the moving parts. This is more than a mere polishing action; the actual structure of the moving surfaces alters. It becomes harder, and the frictional resistance between the moving parts decreases. This third effect has a most important influence on the power output and longevity of model engines, yet it seems to be largely unknown. Metallurgists at Northwestern University investigated and described this phenomenon years ago. However, their findings never received much publicity outside the mechanical engineering profession.

U-Control fliers of the '50s generally didn't have the patience of the earlier free-flighters. They wanted to fly their motors *right now* instead of spending hours running them in on the test bench, and their demands had a major effect on engine manufacturers. Many older, snugly fitted motors that needed a long break-in were displaced by newer models with more clearance between their moving parts. The U-Control crowd preferred ringed-piston engines with ball-bearing crankshafts (like the early McCoys), because they needed practically no running-in.

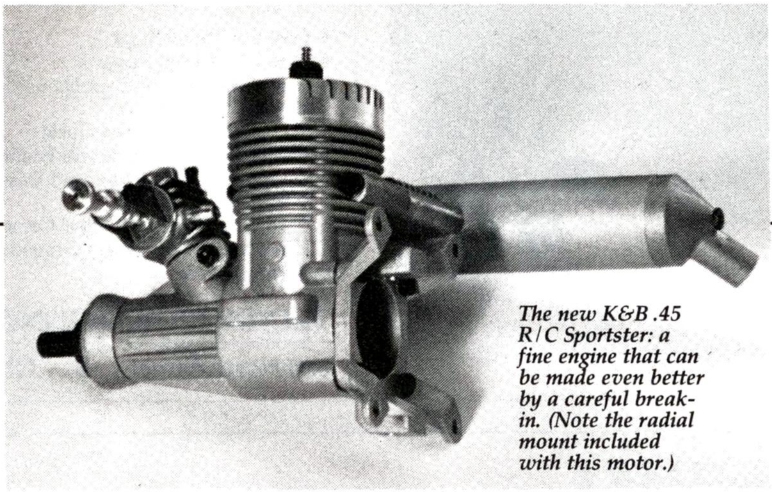
Some makers of lapped-piston, plain-bearing motors struck back with a sneaky trick: In those days, it was usual for all model engines except 1/2As to be individually test-run for five minutes or so at the factory, before being packaged for sale. I think Duke Fox discovered that a little jewelers' rouge injected into the intake of a brand-new glow engine during its factory test-run would loosen it very rapidly indeed.

I don't think K&B ever did this, but both Fox and Veco used the rough treatment regularly. The Johnson engines were actually designed for "custom-fitting" with fine abrasives similar to jewelers' rouge. The Johnsons' moving parts were machined to fit extremely snugly. Then each assembled motor (minus glow plug) was power-driven, while being flooded with a mixture of oil



Taken an hour apart, these before-and-after photos show the results of using Sunbeam's Metal Klean on a badly varnished-up O.S. .10.

es



The new K&B .45 R/C Sportster: a fine engine that can be made even better by a careful break-in. (Note the radial mount included with this motor.)

and a fine lapping compound that was well-named "Time-Saver." In just a few minutes of this, the engine would be as free as if it had been run-in for hours in the old-fashioned way.

However, this sort of short cut only accomplished *one* of the benefits of breaking-in: wearing the high spots off. It had no dimensional stabilizing effect, and it did away with the molecular realignment that results only from the long-term rubbing together of closely fitting surfaces.

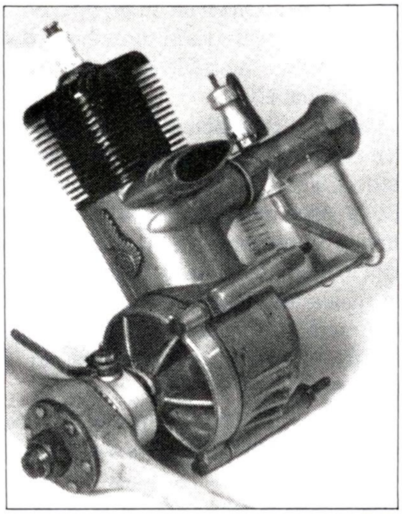
I hated the "rouge run-in" procedure, and tried to convince Veco's owner to abandon it. I took a snugly fitting set of production parts for a Veco .29, assembled them, and then carefully broke in the motor using the slow, traditional method. On the dynamometer, my engine put out over 20 percent more power than a typical "rouged" motor.

But the rouge method continued. It was cheap, and it allowed modelers to run their Vecos full-speed, straight out of the box. But that didn't make it *right.* After a few years, the motor makers stopped using rouge; they found it had more bad effects than good ones. It accelerated wear, so that the original high power output of a rouge-fitted engine often dropped noticeably in just one season's flying.

Most modelers still don't like to take the time and trouble to break in their motors for hours on the test-stand. They prefer to buy 'em and fly 'em, and manufacturers in general have catered to this desire. However, rather than using cheap short cuts like rouge, today's engine makers have invested a great deal of capital in high-precision machine tools and new engine designs.

The machine tools enable manufacturers to make components accurate to millionths of an inch, for fantastically precise fits between moving parts. The new engine designs overcome many of the adverse effects of the fierce heat encountered by a high-powered model engine's piston and cylinder.

Developments such as the ABC-type motor (an aluminum piston running in a chrome-plated brass cylinder liner), the Dukes Ring (expanded against the cylinder walls by the pressure of the power-stroke combustion) and K&B's new all-aluminum "Sportsman" engine design, minimize the changes in internal clearances while running, which earlier types of motors have to contend with. But a long slow break-in always helps!



This 1940 Ohlsson "Custom" .60 was a friend's first model engine. He got it back again recently; still in excellent shape.

Some modern engines, e.g., the British Irvine glow motors, are still fitted as snugly as the prewar spark-ignition types. They're hard to start when new, but when given a careful and lengthy running-in, they become as docile as anyone could want. Other brands of motors, e.g., Cox*, Fox* and K&B* are fitted with enough clearance to permit easy starting and immediate use of a model; but if you break them in anyway, they'll run even better.

Running-in a new glow engine isn't difficult: Use a low-nitro fuel with a synthetic lubricant and a propeller an inch smaller in diameter than the one you plan to fly with. Firmly install the motor (preferably without the muffler) in a sturdy test-stand and run it for two to three minutes at a time, full throttle, *as rich as you can keep it going.*

Leave the glow plug connected if necessary, but be sure that the engine runs "blubbering" rich, spitting out unburned fuel from its exhaust, for at least the first four or five runs. Let the motor cool to room temperature between runs. On later runs, you can lean out the mixture slightly, but it should definitely remain on the rich side throughout the break-in process.

By running-in your engine this way, you ensure that it gets adequate cooling both inside and outside, while its new metal surfaces gradually stabilize and mate with one another. After half an hour or so of this kind of operation, your engine will be nicely broken in. Now change to a fuel containing castor oil; using it *during* break-in slows the process, because castor oil lubricates so exceptionally well.

Sunbeam Solvent

A few columns back, I mentioned that Sunbeam's "Metal Klean" (a solvent that easily removes baked-on "varnish" from model engines) can be bought from Rapid Appliance Service* in Lansing, MI. Many more modelers than expected ordered this stuff, and Rapid Appliance had to back-order about 130 cans. These back orders have now been filled, and the supply replenished. Rapid's price is still the same for *MAN* readers: $3.10 per

(Continued on page 79)

SKYDART

(Continued from page 52)

"Why didn't you use elevons?" I've been telling them to "read the article." Anyway, smile politely during all of this, and prepare to fly. You can also do as I did, and avoid this by flying when no one is around. It's much easier to concentrate!

Start the engine, adjust for maximum rpm, check for proper radio function and hand-launch the Skydart in a level attitude.

The critical phase of the flight is immediately after launch, but once "on the step" the Skydart flies quite well and will loop and roll if the maneuvers are entered at top speed. The Skydart won't stall, but will fly with the nose at a high angle while losing altitude.

The hardest part of flying the Skydart is adjusting to its different shape, and adjusting to the fact that its overall shape is triangular, whether flying level or in a turn. Keep it close and fly smoothly, and you shouldn't have any problems. The Skydart has no bad habits and, with enough air speed, will loop and roll.

When the engine quits, point the nose down to maintain air speed, and let it bleed off at landing flare. The Skydart will then settle in and contact the tailskid first and then slide to a halt.

You may want to cover your Skydart with contrasting colors. I chose to "fold" mine in white and added strips to simulate the fold lines for that "scale" appearance. Remember, this is a *giant-scale* model airplane—not ¼-scale or even ⅓-scale, but a 3.7-scale!

I've been flying from a dirt field and haven't had any real problems with the lack of protection on the fuselage bottom. Others may want to add something. If so, keep in mind the added weight and its effect on the CG.

The Cox .049 Black Widow and Tee Dee engines have both been successfully used. A Tee Dee cylinder and head can also be used on the reed-valve engine to provide good performance. Some may want to increase the short flight times that are typical of these engines. With whatever method chosen, the added weight and its effect on the CG should be considered.

Let's see now, after paper airplanes, I flew those rubber-band-powered stick models. Now, if I can just find a big rubber band...

**Here are the addresses of the manufacturers mentioned in this article:*

Cox Hobbies, 1525 E. Warner Ave., Santa Ana, CA 92705.

Tee Dee; distributed by Cox Hobbies.

GOLDEN AGE

(Continued from page 35)

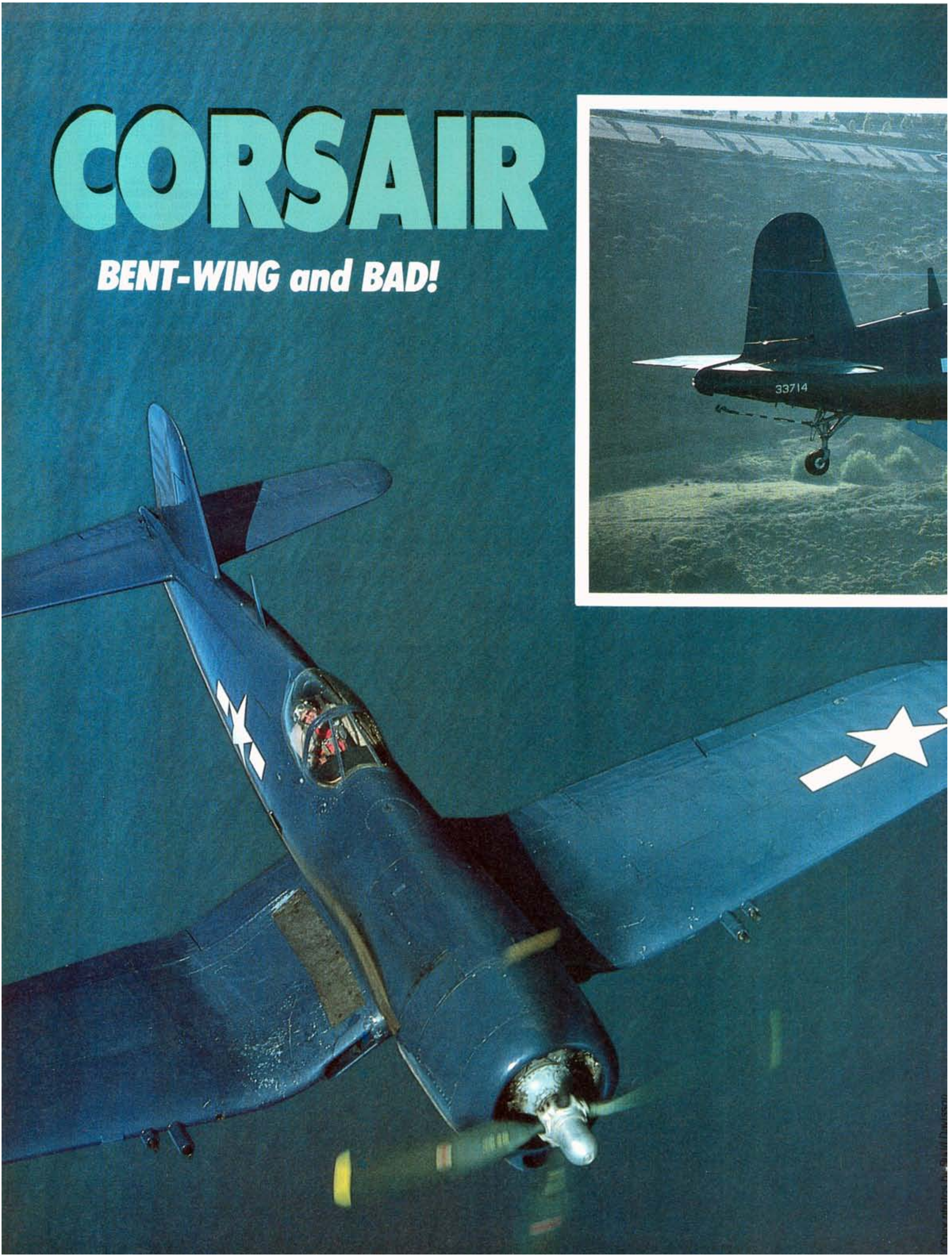
simultaneously. That makes a pretty big bag of tricks, considering that we hadn't yet left the "reed era"!

Radio-control systems are made of many parts which encase and mount the electronic components as well as providing the needed mechanical actions. Initially, these items are handmade to provide prototype examples. With low-volume production (and hobby products certainly were low volume), simple, inexpensive tooling is used to duplicate the prototype parts. In high-volume production, the items are redesigned to make use of mass-production methods that can yield greater precision at a lower cost. We see the results in the impressive-looking

(Continued on page 70)

CORSAIR

BENT-WING and BAD!



There are Corsairs and there are Corsairs!

by BUDD DAVISSON

IN TALKING ABOUT the Corsair, it's hard to know where to begin. This is because it's had such a long history (13 years in production), been through so many different variations (dozens of models, 981 major modifications), been built by three different manufacturers (Chance Vought, Brewster and Goodyear) and is known by several different numerical designations (F4U, FG-1, F3A-1, AU-1, etc.).

So, pity the poor model builder; no wonder we see so many "generic" Corsairs being built. They have hose noses and bent wings, but from that point on, the decisions on which variant to build become momentous—and tedious! Of course, it would have helped if the Navy and Marines had allowed the pilots to go wild with paint, the way the Air Corps did. That way, there would have been some individuality to the airplanes and the models. But the dictum was basic blue, and basic blue is the way most Corsairs were painted. Exceptions to this are the very early tri-color (blue upper, gray lower, red insignia outline) schemes.

Early in its life, the Corsair went through some very radical sheet-metal and structural changes, such as the relocation of the cockpit and a different turtle-deck configuration. However, once the airplane went into production, most of the changes were subtle and hard to discern, because they were the result of bigger engines, heavier armament and changing ordnance packages.

We have to start somewhere, so let's begin at the beginning. However, if, as we wend our merry way along, it appears that I'm doubling back, that's because I am. So many versions of the airplane were being built at the same time by different plants, that there's no straight chronological line to follow.

The family tree of Corsairs has many branches and twisted twigs, and not only is it hard to follow, but it's also easy to make mistakes. So if my information doesn't agree with yours, drop me a line, or better yet, chalk it up as yet another time when you were right and I wasn't.

The Beginning: The XF4U

As originally configured, the most noticeable difference between our mental image of a Corsair and the prototype is what appears to be a flatter "U" to the inverted gull-shape of the wings. In fact, that's an optical illusion brought about by the location of the cockpit and the turtle-deck shape. The cockpit on the prototype is three feet further forward than on production birds, and it's much lower. The result is a much longer-looking tail cone with a flatter curve that makes the wings look a little different.

The original airplane had what, in 1939, was considered heavy armament: one .30-caliber and one .50 in the nose, and a .50 in each wing. It didn't take them long to change their minds.

First Production Machines

• F4U-1. Before going into production, the wing tanks of the prototype were deleted and a 237-gallon fuselage tank was installed. That meant having to move the entire cockpit back. However, the "birdcage" canopy of the prototype was retained, and the airplane was criticized

(Continued on page 64)

CORSAIR

(Continued from page 61)


Silhouette; sunset study of a classic warbird. Reason for "hose nose" moniker is evident!

almost immediately, because of the lousy visibility on final approach. The long nose, coupled with the low seating position required by the flat-topped canopy, meant the pilot couldn't see when he rolled out on final. If the cowl flaps were open, he couldn't even see *that* well. This was, however, the basic airframe, which was modified through all the subsequent variations.


Progenitor of the breed, the XF4U; graceful even then.

The British solved part of the visibility problem with the flat-top canopy by putting a little hump, or bubble, in the top. This allowed the pilot a couple of precious inches of headroom that could be utilized to raise his seat during approach.

To stuff three .50-caliber Brownings into each wing with a total of over 2,000 rounds of ammunition, the fuel and the cockpit were relocated. Compared to the puny armament of the prototype, the visibility trade-off seems justified.

• F4U-1A. With the -1A it was adios, birdcage/flat-top canopy! The Navy replaced the entire, sliding, canopy assembly with a new semi-bubble-type that borrowed heavily on the English Malcom hood concept and gave seven inches more headroom. The birdcage effect was gone, and this greatly improved aerial visibility, and the elevation of the bubble let the pilot see where he was going during approach.

Some of the more subtle changes to the -1A were a taller, inflatable, tailwheel assembly that decreased the deck angle noticeably and made the airplane easier to land. Also, a wicked-looking wedge-shaped spoiler was put on the right wing to correct an asymmetric stall situation.

• FG-1A. FG was the Goodyear designation, and the FG-1A was essentially the same as the Chance Vought. The Brewster version was the F3A-1A.

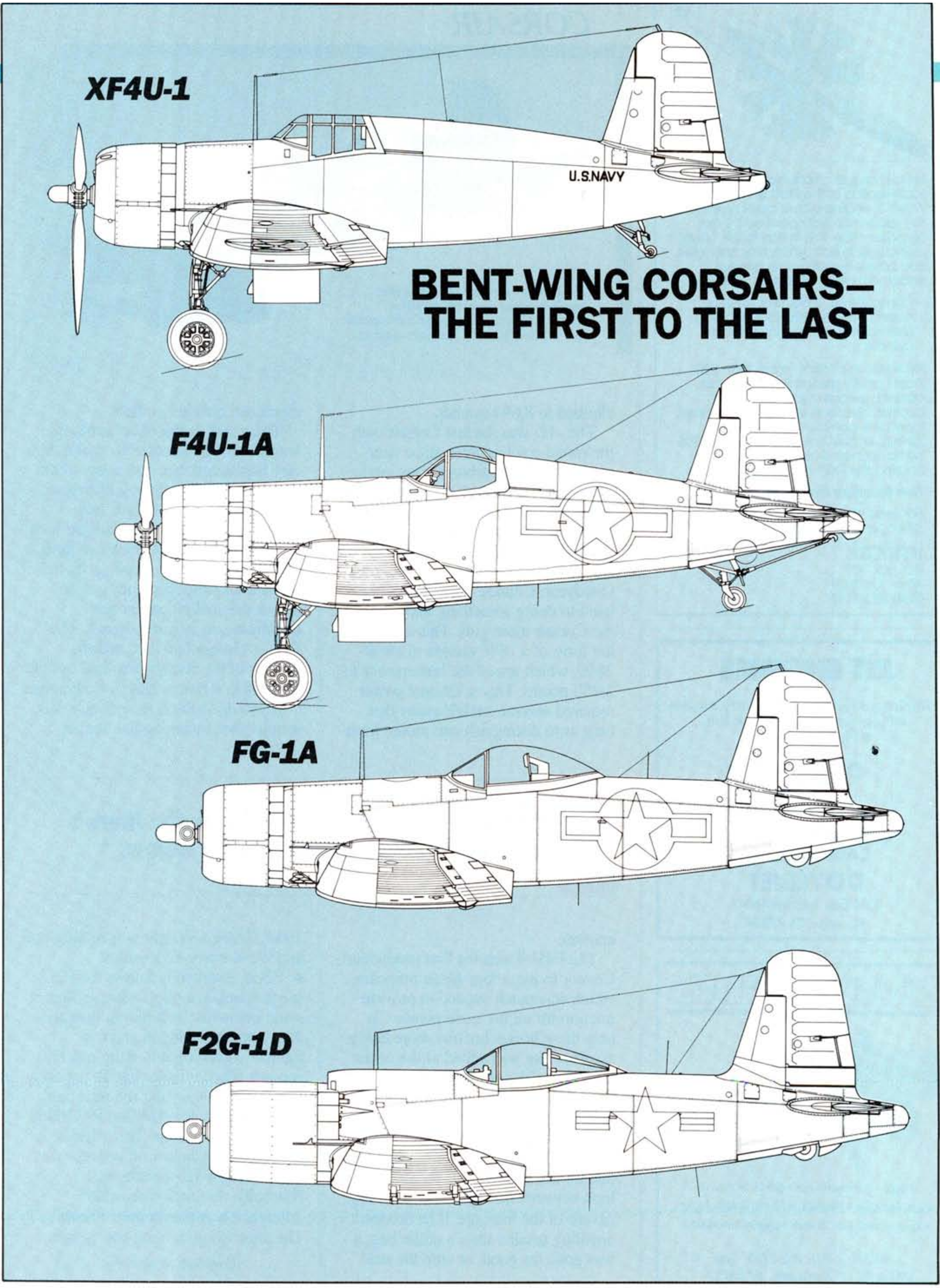
• F4U-1C. A brief "sortie" into ultra-armament was taken for a run of 200 airplanes that used two 20mm cannons in each wing. The pilots liked the heavy hitters, but still preferred the trusty old Brownings. Post-war models later returned exclusively to the 20mm, when the airplane was used mostly for ground-attack rolls. The cannon-armed airplanes are easily identifiable, because of the healthy gun stubs sticking out of each wing.

• FG-1D. The Goodyear-built FG-1D was not only the most numerous of all Corsairs, but has also survived in the largest numbers. Of the wartime versions, very few (one or two) actual Chance-Vought-built 1Ds have survived, so most of the airplanes you'll see at airshows are FG-1Ds, along with a bunch of F4U-5Ns that came in from South America a few years back. The -5Ns are Korean War era night-fighters.

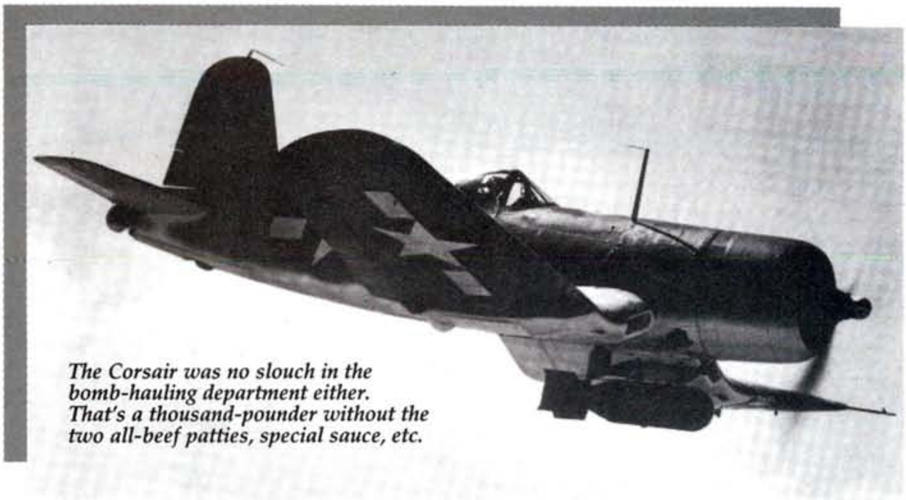
The -1D was a jack-of-all-trades and was equipped accordingly. This airplane went to twin-fuselage pylons for bombs, tanks or napalm, and it had four rocket rails under each wing. The power was up to 2,250hp with water injection, and its empty weight had

(Continued on page 66)

BENT-WING CORSAIRS— THE FIRST TO THE LAST



CORSAIR



The Corsair was no slouch in the bomb-hauling department either. That's a thousand-pounder without the two all-beef patties, special sauce, etc.

climbed to 8,694 pounds.

The -1D was the last Corsair with the round cowling inlet, since later airplanes added carburetor air-intake scoops on the edge of the cowling lip. It was also the last Corsair with a three-blade prop.

• F4U-4. While the lithe little FG-1D was being turned out like cookies by Goodyear, Chance Vought turned its hand to doing something about giving the Corsair more guts. This came in the form of a -8W version of the R-2800, which upped the horsepower to 2,450 ponies. This additional power required several modifications that help us to distinguish one model from another.

The F4U-4 was the first production Corsair to use a four-blade propeller, which was much needed to provide traction for all the extra ponies. To help those horses breathe more easily, an air intake was added to the center lower lip of the cowl, and this greatly altered the air opening.

The F4U also went a long way towards cleaning up the interior of the airplane. In prior models, the cockpit had no floorboards, and the pilot could look between his legs at the yawning cavern of the fuselage. If he dropped anything smaller than a duffle bag, it was gone for good, or until the next mechanic crawled in there.

The panel on the older airplanes was a little haphazard. No; make that *very* haphazard, because a few of the controls weren't anything like those found on any other fighter. For example, the flaps were actuated by a funny little lever that stuck out from the left side of the cockpit up by the instrument panel, and they pointed across the cockpit, rather than lengthwise, as in most aircraft. The F4U-4 changed all that, and the interior of the cockpit was laid out like most other fighters, Navy or otherwise.

If you don't think the military was serious about winning the war, in 1944, Chance Vought was turning out an F4U-4 every 82 minutes!

• F2Gs. Everybody knows the F2G story: Kamikaze pilots were getting in some below-the-belt blows, because they came sneaking in and our fighters couldn't get to them quickly enough. Since missiles hadn't yet been invented, the Navy did the next best thing; they stuck a 4,000hp R-4360 in the nose of a Corsair. The original missile-with-a-man-in-it concept was a beefed-up F4U-4 airframe. Naturally, the most noticeable difference was the forward firewall. The super-long cowling and gigantic

(Continued on page 96)

"So many versions were being built; there's no straight chronological line to follow."

Pattern Matters

by MIKE LEE

IN MY LAST COLUMN, I told you that the Team Race R/C Club of Pearl, MS, would hold a pattern contest featuring all classes in turn-around style. This club put together a pattern meet in which all classes from Novice through Masters flew a turn-around-type pattern. The Novice Class fliers flew three consecutive maneuvers and were then allowed to exit the box. These maneuvers were followed by another three, and then an exit again. In this way, the novice wasn't overwhelmed by the swift barrage of pattern maneuvers. For the more proficient classes, there was less time allowed between maneuvers.

This is a neat idea, and one that's apparently now catching on. Here in sunny Southern California, a similar contest (same format) is going to be held this summer. I think the NSRCA mentioned that at least two other contests of the same format will be held in other parts of the country. How about that!

I've previously mentioned that this country will have to revert to "Turn-around" to produce top-notch pilots able

Chip Hyde is seriously trying to explain to Deano (holding wing) and Buck Faure that he's going to fly this ship in FAI in 1988. Obviously, Deano and Buck are impressed with the National Champ's guts.

to compete on a world-class level. It's obvious to me that the AMA hasn't yet taken the initiative in this, but dedicated individuals who are concerned about pattern, have. So far, I haven't heard anything definite about developing this sytem at AMA, but I hope this column will help motivate someone there to get the ball rolling. I love AMA pattern, but don't want to be behind the times as far as the rest of the world is concerned.

Futaba PCM Conquest is typical of a new breed of radios that can make pattern flying smoother, if not easier. Just enough functional bells and whistles!

This month, I'll start the tech talk on the subject of the roll. Many newcomers to pattern don't know what the right roll rate is for performing a pattern. I've seen many Novice- and Sportsman-Class pilots perform, and the roll rates used were far too slow or unbelievably fast. Let's try to find a happy medium—a proper roll rate.

Before you cry "Foul," I'll say that the *right* roll rate is the one which best fits your particular style. As in tennis, each player has a certain way of serving the ball, so we in pattern have a certain way of "serving" the plane to the judges. Whether a fast roll rate or a slow one, it's the way *we* like it. This discussion will concentrate only on the starting point.

For both Novice and Sportsman Classes, the fastest roll rate required is the one used to get the ship out of the Immelmann turn correctly. "What?" you say; "The Immelmann?" Yup; because it's here that the plane is normally at its slowest, and it's then required to roll. Let's dissect the maneuver:

The Immelmann Turn is simply a half-loop with a half-roll at the top. The book calls for the maneuver to begin the roll at the exact point that 180 degrees of loop is completed. Take into account that here we're performing an all-climbing maneuver and bleeding off speed on the way up. To make the loop portion look good, we usually make this as large and as graceful as we can. This is to avoid the impression of pulling too many Gs and looking unrealistic. But the bigger the loop, the more speed you bleed off.

This means that our ship is now flying at a lower speed than the speed used to set up the roll rate initially in practice. In practice, we probably established our speed point to perform a 360-degree-per-second roll. At the top of this loop, this speed point may be down to less than half that. As a result, the plane falls through the rolling portion of the Immelmann and loses points.

There are three cures. The first cure is obviously to increase the roll rate, but this may not suit a pilot, as he may then feel that the roll rate is too fast during normal rolling. He can compensate for this by paying more attention to the stick, using less than full deflection when rolling, and so adjust the roll rate to suit himself. However, this isn't ideal. When flying in these classes, most pilots simply nail the stick to the side and let the ship roll. Fine control of the stick movement usually comes with increased proficiency as we climb the pattern ladder. However, if the pilot can reliably perform rolling maneuvers and maintain fine stick movement to adjust the roll, he should do this as soon as he can.

An alternative is to use the ship's rolling tendency to assist you. The engine up front produces a torque movement,

Craig Millet proudly shows the gorgeous Spirit design he's using in Turnaround pattern. This very clean ship is fast, despite the engine's rpm... it just goes fast!

which in the case of models is opposite to the direction of the engine's rotation. (That means counterclockwise, if you're standing at the rear of the plane.) We try to offset this torque with a little right thrust, but it's always present, and we'll use it to our advantage by rolling with it.

In practice, the ship will perform the looping portion of the Immelmann and simply roll to the left. As rolling right will roll *against* the torque, rolling left goes *with* the torque and the roll will be faster and cleaner.

The third cure is the use of dual rates. This is how *I* did it, and it wasn't that hard to learn. I set up the roll rate so that at high-rate aileron the ship would roll very quickly (about 540 degrees per second) and the low rate was set at about 270 degrees per second. This gave me a fast roll rate for exiting maneuvers where speed had bled off (like the top of the Immelmann), or maneuvers where a fast roll rate was desired (as in the Figure M with half-rolls). On low rate, I could perform the three axial rolls by simply nailing the stick to the side. This resulted in a three-roll maneuver that lasted almost five seconds, or a slow roll that was easier to manage than with a single-rate stick.

Getting used to using the dual-rate switch is something you work into the routine. I'll start with the Sportsman

Clair Seiverling from Phoenix, AZ, holds a beautiful Arrow for Expert AMA pattern. Clair is a master craftsman, and this photo doesn't do his ship justice.

No doubt, the Aurora design is catching on, as this gaggle of ships proves. They were recently gathered in Southern California for a meet in Chula Vista; all belong to different pilots.

Class, using the dual rates, and I'll name the maneuver and the rates I used:

- Takeoff was first, and low-rate aileron and elevator was used. I did this to minimize sudden movements so that the ship would rise smoothly. Each sudden jerky movement loses an average of half a point. (I'm taking for granted that this is an uneventful takeoff sequence with no crosswind.)
- Non-Rolling Figure M. Low-rate aileron; possibly low-rate elevator. This assumes that you won't need to roll at all after turning around from out yonder and that you're comfortable with both a high and a low elevator rate. Low-rate aileron will keep sudden movement out of any corrections you may have to make, so giving a smooth overall appearance to the maneuver. Nothing irks the pattern judge more than sudden movement!
- Cuban 8. High-rate aileron and high-rate elevator. This maneuver will see the ship loop through 270 degrees of vertical, followed by a hesitation and a half-roll, hesitation, and repeat for the second half. Most of us will throttle back just after coming over the top of the loop. That means we're slow from bleeding-off speed in the loop, and here's where the high rate of aileron is needed. The high-rate elevator is also needed to pull through the second half. During the hesitation portions, a little down elevator may be needed to hold the attitude, and high-rate elevator will help.
- Immelmann Turn. Low-rate elevator and high-rate aileron. (We've already discussed this one.)
- Three Inside Loops. Low-rate elevator and low-rate aileron. Let's keep everything smooth with no sudden movements.
- Straight Inverted Pass. Low-rate elevator and low-rate aileron. You're going to be at full power and speed, so the low-rate aileron won't hinder you as you roll to inverted, or out of inverted. Low-rate elevator keeps you from "porpoising."
- One Reverse Outside Loop. High-rate elevator and low-rate aileron. You'll probably need a substantial amount of elevator pushing through this one, but the low-rate aileron will be OK when entering and exiting the maneuver.
- Three Axial Rolls. Low-rate aileron and low-rate elevator. The three rolls look good when done in the five-second time frame. If you do it faster than that, it looks rushed, and it also demands more of the pilots' reflexes on the elevator as the ship rolls through. At the five-second rate, the pilot can just nail the stick to the side, and he then concentrates only on the elevator compensation as he rolls through.
- Landing. Low-rate aileron and high-rate elevator. I know that the elevator controls the rate of sink, not the throttle. You can fly the ship slowly with a nose-high attitude, using the throttle to extend the glide path if necessary. Very little aileron adjustment will need to be made if the initial attitude is maintained.

There you have it; my method of dual-rate usage. Remember, it's only *my* style. You may have a completely different style, which is more suited to *your* ability. But if you're now learning this type of flying, i.e., the use of dual rates, then this is a good starting point. Also, remember that you'll change the rate switches on the turnaround. My favorite place to make the switch is right after I pull the ship up to do the split-S maneuver. I pull the ship, hit the rates, and then roll over and turn around. That way, I get the feel of the rates before I perform the next maneuver.

Dual rates are definitely an asset to any pilot who likes banging the sticks more than maintaining the fine stick movement that proficiency will eventually result in. Because the classes of pattern are supposed to be the place to learn, it becomes natural to recommend these alternatives. You'll become more skillful in time, no

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GOLDEN AGE

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systems which we have today. The drawback is that mass production requires complicated and expensive tooling for complex machinery. You have to be a real optimist to follow this path when its potential isn't apparent!

Howard Bonner was obviously an excellent mechanical engineer. His servos and gadgets reflected the use of mass-production methods. He confidently carried this philosophy into his radio production, and his "Digimite" R/C system was an excellent example of state-of-the-art mass-production techniques in 1965.

At that time, Cliff Wierick was an up-and-coming R/C modeler with a definite aptitude for pattern competition. A former AMA president, Cliff's best-known pattern accomplishment is a Nats win, with a score only two points less than perfect. At the '67 Nats, with two scores within five points of perfection, it was obvious that, with proportional control, performance had outgrown the maneuver schedule, and a more difficult schedule was quickly adopted. I'm indebted to Cliff for some inside information that explains the Bonner radio endeavor in more detail. Today, we know Cliff as a main cog in the familiar "Airtronics" operation.

To begin his radio project, Bonner assembled a staff of electronic engineers; Howard would handle the mechanics of the design. The primary designer was Gordon Larson, and he was assisted by Frank Kagel and Frank Hoover, who went on to establish F&M Electronics. Supposedly, Bob Elliott migrated from New England to work with the group before joining Jerry Krause to form E-K Electronics in Texas. Cliff Wierick was to be the test pilot and evaluator, and, as a "ham operator," he would handle the two-meter portion of the design.

Cliff points out that as a "ham" operating on the two-meter band, he easily avoided the widespread interference (caused by the large number of CBers) that was always a possibility on the 27MHz band. The CB talk channels became glutted, and some CBers found a solution by using frequencies that had been allotted to R/C. On the positive side, this "problem" gave the FCC a good excuse to give us some 72MHz frequencies at a later date.

This seems a good place to reflect on the events that resulted in our current R/C frequencies. Before the FCC established the CB band, the only place R/C could

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GOLDEN AGE

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operate was on the "ham bands"—frequencies set aside for experimental use and amateur radio communication. The R/C pioneers found the two-meter band (50-54MHz) most useful for R/C. An agreement among the "hams" left the upper portion free for R/C use. The only catch was that you needed a license to use this band, and this meant a knowledge of radio electronics and learning to use the Morris code (not an agreeable task for most modelers).

The FCC saw a widespread need for a license-free spot for amateur communication as well as for R/C. They met this need with the Citizen Band at 27.255MHz. This frequency was immediately very popular, and this really caused a problem. The obvious solution was to divide the 27 band into a number of channels and to assign them to specific usage. R/C was given five spots in the band as well as the original 27.255, which remained open to unrestricted use. For several years, this was the deal, until the AMA convinced the FCC that we needed isolated frequencies. As a result, our 72MHz spots were added, while we continued to have the use of the 27 spots. Finally, we lost the 27 spots and acquired the arrangement which is now going into effect. R/C hasn't only grown up but has also come of age!

There's a lot more to the Bonner "Digimite" story, including details of its operation, and I'll have it for you next time.

Have you range-checked? Wound your escapement? Said a prayer? Hope!!

PATTERN MATS.

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matter what style you learn under. By the time you hit Expert or Masters Class, you won't be as dependent on the dual rates as you once were, and you'll be able to make as fine a stick movement as is needed in almost any situation, whether you use dual rates or not. Learn fine movement as early as possible, but do it as painlessly as possible. This way, not only will a roll become easier, but all other movements will be just as easy.

And now that you know how to get a proper roll rate, don't forget what the judges are looking for. Read the rule book . . . over and over again. Don't just read the pilots' section, but read the judges' section too, as that's where you'll learn what the judges are looking for. It may all seem

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PATTERN MATS.

(Continued from page 72)

rather regimented, but there's definitely room for style. Do what the book says, and be aware of other pilots' flying styles. Watch, and be ready to adopt better styles, as it may help your scores.

It's springtime in the pattern country, and we've been flying since February. The new FAI pattern is really difficult to fly, and it will be exciting to watch it on the international scene. The AMA pattern is equally exciting; pattern is on the move again. Just wait till you see what the future holds for us all; till then, we're on the pipe and airborne.

CALIPH

(Continued from page 40)

there's any kind of head wind.

I wasn't able to get the Caliph to do any snap maneuvers, but if the CG was slowly moved to the rear, it could be made to spin. By doing so, you might get your plane in a flat spin, and this is much harder to recover from than a nose-low spin, so be careful. Even though snaps and spins weren't for *my* Caliph—at least, not yet—the little airplane is a pleasure to fly. Inverted flight, Cuban 8s, stall turns and semi-axial rolls are well within its capabilities. Keep in mind that this is all with the refreshing beat of an O.S. FS.20 4-stroke—the smallest production unit in the world.

During all throttle-off maneuvers, the O.S. only went dead once. This little engine outdoes some of the bigger ones in the idle department. The tip plates on the wing not only give the Caliph great aileron response, but also give rock-steady control right down to a crawl.

I found the Caliph/O.S. package ideally suitable for plain relaxed flying. I'm sure that the model could do equally well powered by any .15 to .20 2-cycle engine, or an electric propulsion package. It's a nice-size, economical package; one that's likely to find a welcome home in your hangar.

**Here are the addresses of the companies mentioned in this article:*

Davey Systems Corp., 1 Wood Ln., Malvern, PA 19355.

O.S.; distributed by Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

Dave Brown Products, 4560 Layhigh Rd., Hamilton, OH 45013.

Carl Goldberg Models Inc., 4734 W. Chicago Ave., Chicago, IL 60651.

Major Decals; distributed by Northeast Screen Graphics, P.O. Box 304, E. Longmeadow, MA 01028.

Desert Hawks' volunteer awaits pilot's order to launch large-scale Bucker Jungmann.

by ALAN GORNICK

SECOND ANNUAL

LAKE HAVASU

FLOAT FLY

TO THOSE OF YOU who live in the north of our fair nation, the idea of a float fly in the middle of January might seem more than a little odd; perhaps bizarre; probably certifiable. After all, first you'd have to chop a *really big* hole in all that ice, and then you'd have to actually stand there while it (and you) re-froze! And the idea of having to retrieve a disabled model, well ...that's too horrifying to even contemplate!

Now let's dream a little...what if we had our druthers? Suppose there was a place where a really big puddle of water was provided for us? And furthermore, the weather around that puddle was such that we could actually go outdoors without earmuffs, and even wear a swimsuit and get a tan! As long as we're at it, we might as well conjure up soft sandy beaches from which to launch our float planes, and a first-class hotel and restaurant within a few steps of the flying site. Our site should definitely be near sea level so that we can extract full performance from our aircraft and, dare we think it, the area's hotel management, local politicians and business people should welcome model airplanes and their pilots! For the icing on the cake, let's add an active and dedicated local R/C club to handle all the preparation and professionally orchestrate the whole thing, and a bevy of elaborate awards and prizes... catalogs full of them!

Wake up! It's *not* a dream! This place really exists at the beautiful Nautical Inn Resort in Lake Havasu City, AZ, and all the other elements of our dream exist there too!

Prototype Bob Martin Models ETOF (Easy Trainer On Floats) being launched.

Thomas Hart's scratch-built Terrier; O.S. .28-powered.

An ideal location for a Float Fly, Lake Havasu City, located very near the junction of the Arizona, California and Nevada borders, is now the home of London Bridge—the *original* London Bridge—which was laboriously and expensively moved piece by piece and reconstructed on its present site in 1971. Lake Havasu itself is a 45-mile-long impoundment of the Colorado River behind Parker Dam, and it lends itself to a wide variety of water-oriented activities including, of course, R/C floatplane flying.

Held on January 16 to 18, and sponsored by the Desert Hawks R/C Club, the Second Annual Lake Havasu Float Fly was a spectacular and exciting event. It was attended by 50 pilots from four states, flying over 70 floatplanes and amphibs, ranging from .049-powered to 1/3-scale. The Float Fly is held each year on the beach, directly in front of the Nautical Inn Resort. For this year's event, the Desert Hawks cordoned-off the beach and the adjacent lawn area in a way which separated and protected the airplanes and pilots, while still maintaining maximum visibility for the many spectators.

Of course, safety is everyone's concern, and the Desert Hawks really did a great job in this area with thorough, yet expeditious, preflight checks of aircraft and radios, and assignment of helpers and observers to each pilot. They also used the Pacific Plan, which utilizes three separate flying areas for frequency control. As a result, even with a large number of spectators, everything went smoothly, with no radio interference problems. To aid launching and retrieval, the Desert Hawks stationed members wearing waders along the shore, and others waited on pontoon boats for the immediate retrieval of disabled aircraft from the lake. These people helped immensely in the smooth running of this event.

As I mentioned earlier, the range of airplanes brought to this Float Fly was incredible, and the quality of construction and flying defies description. (Check out the photos for proof.) To give you an idea of the variety: The smallest plane was a scratch-built amphib of unknown origin, powered by a throttle-equipped Cox .049, and what a flier it was! Largest was Bob Seigelkoff's scratch-built scale model of a Supermarine Walrus, powered by a 5-cylinder Saito 4-cycle radial engine and complete right down to scale machine guns and gunners. The youngest pilot was 15-year-old Marc Young, capably flying a .25-powered Jr. Sky Tiger with Odie the Wonder Dog in the cockpit. The oldest airplane flown was Bob Howland's O.S. .25-powered original-design monoplane with 29 years experience under its wings—and we all know what an accomplishment that is!

The most popular aircraft appeared to be the Piper Super Cub, flown in sizes from .25-powered to 1/4-scale, and this was followed closely by the Bob Martin R/C Models E.T.O.F. (Easy Trainer On Floats), designed for .25-size engines.

Below: Sig Cub with O.S. 108 built by Ray Hall, flown by Dan Parsons.
Right: 15-year-old Marc Young with his .25-powered CGM Jr. Sky Tiger.

Rescue crew on pontoon boat worked efficiently throughout the day and also warned errant boaters away from takeoff and landing areas.

(Incidentally, Bob will soon be marketing this kit for .40-size engines; prototypes flown during the weekend performed exceptionally well, and the plane should be a *very* hot item.) Another prototype making its first flight at Havasu, and a great performer to watch for, was Joe Bridi's 96-inch wingspan Super Bee, powered by a SupreTigre 3000.

A rather unusual float aircraft was a ¼-scale Quadra-powered Morrisey Bravo, built and flown by Carl Abejon. Carl is not only a fine scale builder, but also takes pride in scale-like flying, and his flights were beautiful to watch. Another crowd pleaser was Jim Lime's beautiful Fly Baby biplane, powered by a 270 Saito. This one looked (and sounded) so real that, after it landed, I almost expected someone to step out on the floats and start fishing! Of course, there were many other outstanding airplanes, far too numerous to mention, as well as many trainer types flown by those just getting their floats wet.

There was something for everyone at this event and at the incredibly generous raffle and award ceremony on Sunday afternoon. First prize in the public drawing was a fully built scale J3 Cub, complete with engine and radio. As intended, it was won by a non-flying spectator who is now eagerly looking forward to flying his prize and joining us in our sport/hobby! For the participants in the Float Fly, there were literally hundreds of prizes; I don't think anyone went home without winning something. Just a few of the many prizes: a Twin-Star 2.4 2-stroke twin engine, an Airtronics 7-channel radio, at least a dozen kits, floats, fuel (24 gallons), adhesives, paints, tools, discount and gift certificates, as well as accessories of every type. It took almost an hour to give it all away! Oh, yes... the Desert Hawks also gave a beautiful flight-box plaque to each participant!

Floats seem to be heading in the right direction; it's the airplane that's playing submarine!

Ahhh, boy! If you'd been there, you'd know what a delightful event this Second Annual Lake Havasu Float Fly was! If you weren't there, you now know what you missed, but there's even more planned for next year! Just for starters, think about a ¼-scale recreation of the Schneider Cup Air Races for floatplanes of the '20s through the '50s! Think of an even *larger* floatplane Fun-Fly with even *more* fabulous prizes! And think of all the great flying and camaraderie that will be available by the big puddle at the Third Annual Lake Havasu Float Fly during the third week in January, 1989! I look forward to seeing you there! For information about next year's Float Fly and the Schneider Cup Races, call Bob Martin at (602) 855-2016.

ABOUT ENGINES

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7-ounce can; plus UPS charges of $2.50 for one to six cans; $3.50 for any quantity over six.

I finally managed to acquire a couple of well-carboned old engines so I could test Metal Klean myself. It *does* work! It's not quite perfect; the baked-on brown coating on a 30-year-old Fox .15 had *nearly* disappeared after a double treatment with MK, but minor traces remained, and I had to finally remove these with an old toothbrush and Ajax cleanser. However, an early O.S. .10RC provided a fairer test; Metal Klean removed *all* of ten year's worth of baked-on varnish in less than an hour!

Metal Klean is great stuff; just be sure to follow the directions on the can implicitly! Its grease-attacking power is so strong that it will dissolve skin oils and subcutaneous body fat if any of it gets onto your unprotected skin—it's better to be safe than sore!

**Here are the addresses of the companies mentioned in this article:*

Cox Hobbies, 1525 E. Warner Ave., Santa Ana, CA 92705.

Fox Manufacturing Co., 5305 Towson Ave., Fort Smith, AR 72901.

K&B Manufacturing, 12152 Woodruff Ave., Downey, CA 90241.

Rapid Appliance Service, Inc., 1454 E. Michigan Ave., Lansing, MI 48912.

SPORTSTER 90/120

(Continued from page 31)

wing airfoil is symmetrical, and the manual provides instruction on how to use a special jig strip to establish rib alignment over the plans. Landing-gear reinforcing blocks are epoxied into the rib structure, and care must be taken to mount the 3/16-inch wire struts accurately and to see that they are rigidly reinforced.

Next, the fuselage is built with a lower section of balsa slab sides and a cross-sheeted bottom. (The top half is added later.) The bottom section includes the installation of the engine mount and the firewall, as well as the installation of nyrod pushrods during framing up. The upper section consists of plywood formers and stringers, which give the body a rounded shape.

My first construction difficulty was encountered when building this upper section, as I discovered that the pre-cut hardwood stringers for the "hood" just aft of the firewall were 3/8 inch too short. The .90-size-engine version has the firewall 3/8 inch further forward than the 1.20 4-cycle version, but the plan was drawn based on the 1.20 engine, and the parts were cut to match that plan. Sheet balsa is bent around the formers and stringers at the hood and, in my kit, the sheeting pieces were too brittle. Despite having been soaked in water and ammonia to accept the bending required, the sheets split badly.

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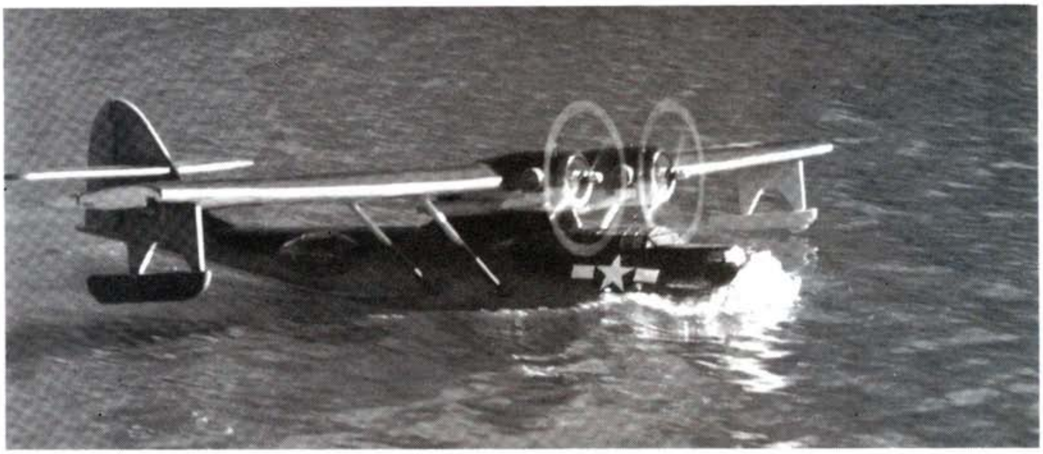
Floating Around

by JOHN SULLIVAN



Nine-foot PBY Catalina built by Gary Emerson from Sid Morgan plans. Two O.S. .60 long-strokes used for power. Simply Beautiful!

During the two years that *Model Airplane News* has featured a regular float column, we've learned that when we publish a picture of either a PBY Catalina or a deHavilland Beaver, we're flooded with inquiries about the aircraft. Two columns ago, we brought Beaver fever to our readers; this time, thanks to modelers Gary Emerson and Bill Price*, we've finally been successful in tracking the "Cat."

The PBY Catalina, in all its variations, is referred to as the "Queen of Amphibians," and there are many reasons for its title. First of all, the Catalina sits smack in the middle of amphibian history. Aesthetically, it's a perfect mid-point between the early Short-Calcutta types with their box-kite configurations and the anhedral winged Martin Seamaster that's as sleek as a snake on rails. It's more numerous than the Short Sunderlands, the Martin Mariner and the Japanese Kawanishi "Emily," as there were more than 3,200 Cats employed by the U.S. Armed Forces and our allies.

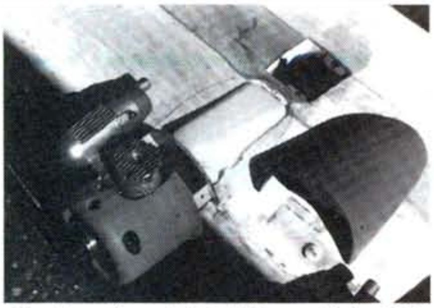
Bill Price and his 78-inch PBY for twin .40s. See text for specs and kit information.

The first Catalina was ordered by the U.S. Navy in 1935 and delivered in 1937. The durable amphibian was classified as a patrol bomber. Powered by two 1,200hp radials, and armed with three .30- and two .50-caliber guns, and either four 1,000-pound bombs or two 2,000-pound torpedoes slung from the wings, the PBY had a range of 2,000 miles and could stay aloft, without refueling, for 24 hours. Catalinas were built by Consolidated, Vickers, Boeing, Vultee and the Naval Aircraft Factory in Philadelphia, and are credited with the best service and production records of any amphibian of the era.

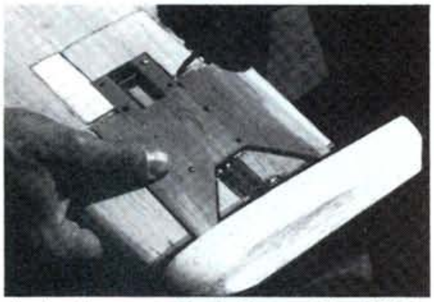
To a great extent, this alone might explain why the Catalina became "royalty." But to hold the crown forever, the PBY had to be indelibly etched into the human imagination, and the Cat has accomplished this with ease. Even today, over 40 years later, you can find men who remember the long, cold flights past Murmansk or Gibraltar, mechanics who maintained fleets of Cats in Singapore and Guadalcanal, or servicemen at Midway or Morocco who watched this magnificent bird-fish beast come thundering out of the overcast skies, only to disappear moments later. The Catalina forced many a U-boat commander to keep his head down or lose it, and it made even more Zero and ME109 pilots think twice about sliding down a blind spot and coming within range of the Cat's machine guns.

The only troubling aspect of the fact that the Catalina is appearing in history books is that history is time, and time devours everything. Further, there just wasn't much need for a patrol bomber after the war, and the Catalina might become an endangered or, worse yet, extinct species. Every year, we hear of the demise of another Catalina: Jacques Cousteau's son was killed in one; the

Gary Emerson installing outer wing panel. Note top access hatch.



Nacelle and cowl installation on Price PBY. Note tank orientation and throttle servo hatch.



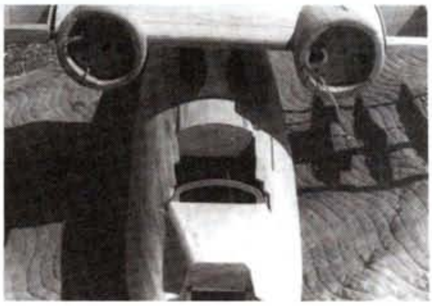
SpringAir retractable tip float on Price PBY. It will be enlarged 20 percent and raked to eliminate digging-in problem.

Confederate Air Force crashed one of their two. The PBYs sink from neglect, become navigational hazards, get dragged onto the shore and scrapped like an enormous pile of tattered lawn furniture. Too bad. There *are* movements afoot to save the remaining Catalinas: In Alaska, the Army National Guard recently airlifted a PBY called the "Queen of Dago Lake" to Anchorage, where it will be restored by Alaska Aviation Heritage Museum personnel. For $56, that unfortunate plane had been stripped of its engines and all usable parts 20 years ago, so restoration is a monumental task, but well worth it.

A fact too often overlooked is that, in a very real sense, modelers are also historians and preservationists. It should be obvious that we're very protective of aviation's history, and part of what drives us is the will to preserve. It's this drive, coupled with an ability to endure hundreds of hours of hard work, which enables modelers like Emerson and Price to wake up one morning, realize that they "just have to have a Catalina," and then proceed to build one.

This column has taken about four months to come to fruition. At the beginning, there were two Catalinas available: a 102-inch fiberglass version from Tiger Models (available through Tower Hobbies*) and plans for 6-foot and 9-foot built-up versions as supplied by Sid Morgan*. Gary Emerson decided to build the 9-foot Morgan plan version. About a month into Gary's project, Bill Price, another local modeler, announced his intention to scratch-build a fiberglass-and-foam Cat for twin 40s from his own plans. As the deadline for this column approaches, Price is one week from completion, and he plans to kit his version, so I'm including information on that project as well as Emerson's.

Gary Emerson's 9-inch Catalina took about two-and-a-half months to complete and two flying seasons to iron out the kinks. A lot of my mail regarding the PBY comes from readers just getting into R/C who have chosen the Catalina as their first project, and Emerson's experience is very useful for these beginners. Gary has built and flown pattern ships for several years. His first experience with scratch-building from plans was a pleasant one, and he thinks he could have built the PBY with techniques he had mastered by his second or third kit

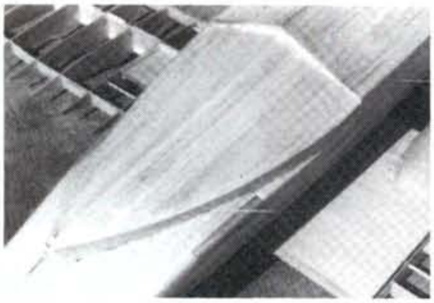


Final framing and planking stages. Rigid wing pylon.

plane—but *only* at that point.

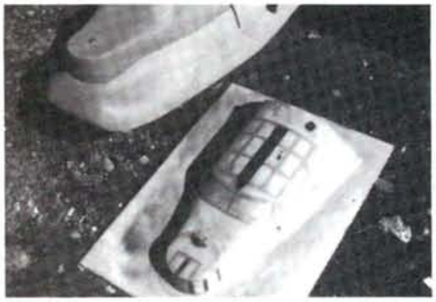
As drawn, the Morgan PBY has a central plywood box-crutch to which bulkheads and stringers are attached to give the fuselage its skeletal shape prior to strip-sheeting. The tail feathers are cap-stripped ribs, leading and trailing edges, etc., with some unusual cutouts in the elevator and rudder to allow them to move unhindered. Gary beefed up the pylon section with ⅛-inch light ply webs and, in general, framed the fuselage to the pylon and the pylon to the wing center-section in a much stronger fashion than the plans called for. He thought that it was worth adding weight near the CG for increased peace of mind, and I agree.

Gary planked the fuselage with $\frac{3}{32}$x⅜-inch balsa strips with beveled edges. This was a job he worried about, but he did it without too much sweat. The aim is to come tolerably close with strip sheeting and then let sandpaper finish the job. There's a large forward hatch designed into the Morgan PBY fuselage, so it's fairly easy to deal with pushrods, servo mounts, strut hardpoints, radios, etc. Blisters and cockpits are available from Morgan, and these trim easily to mount on the fuselage. At this point, the fuselage was basically complete, and Gary moved on to the wing.



Step area shows planking method. Wing was later fully sheeted and glassed.

The wing center-section is actually built on the pylon, and the outboard wing sections plug in using plywood tongues. Gary used Hayes* fiber-filled mounts on the twin long-stroke O.S. 60s and bolted those units to the center-section firewalls. The two 12-ounce tanks are buried for life in the nacelles and, because half-throttle is enough speed for the Catalina, the tanks allow 15-minute flights with a comfortable margin. The engine servos are mounted in a hatch in the center section, as are the controls for the retractable wing-tip floats. As a final touch to the center section, Gary welded on special



Fuselage mold and final canopy mold that features raised frame lines.

aluminum headers and mufflers, which tuck under the nacelles and look real.

Gary also deviated from the Morgan plans by sheeting the outboard wing sections, instead of employing the recommended built-up, cap-stripped, open structure, and he fashioned the struts from spruce to make them functional. A jack-screw was installed in the wing center-section to actuate modified Goldberg*

(Continued on page 101)

Quiet Flight

by JOHN LUPPERGER

IT'S VERY GRATIFYING to receive so many letters in response to my column. I hope that I give you useful information that makes your hobby more enjoyable. As I said in my first column, I welcome your contributions and would like to hear from you or your club. We can share good information here, in print, if only you'll take the time to write.

Model of the Month

Our "Model of the Month" comes to us from Jim Stevens of the Soaring Union of Los Angeles (SULA), CA. Jim has produced several technically innovative designs that are not only good-looking, but are also excellent fliers. Jim's talents may be due to the fact that, before he retired, he was the Senior Technical Specialist in aerodynamics for one of the major aircraft companies in California. This background, along with a great deal of model-building skill, makes Jim's models exceptionally good performers.

Jim's model—the T'Tse IIC—is a full-house thermal model. It features rudder, elevator, aileron and split flap controls. The very sleek model is of all-wood construction with carbon-fiber reinforcement at the spars and in the tail boom. Jim also designed the airfoil, which I'll feature *next* month, as I still have to get it entered into a computer profile program.

Split flap arrangement on the T'Tse makes for slow landing approaches with very little pitching moment. Split flaps produce high drag without proportionately increasing the lift.

The T'Tse spans 78½ inches and has 576 square inches of wing area. Its flying weight of 38 ounces produces a wing loading of 9.5 ounces to the square foot. The full flying stab has an 8-percent symmetrical. Jim uses a 7-channel Futaba* radio, and the T'Tse can be flown with the rudder and ailerons coupled or uncoupled electronically.

Clarence Sailplane Society's diehard (or should I say "ever-ready") bunch of electric flyers, prior to our recent Fun Fly. Aircraft designs ran the gamut from old-timers to original creations.

I flew the model and was quite pleased with the thermal performance, even though the T'Tse has less wing area than most two-meters. It's very stable on tow and has a good speed range. On final approach, I lowered the split flaps and was surprised by the lack of pitch-up tendency. In fact, at full deflection (about 80 degrees or so) it's necessary to hold some up-elevator to compensate for a nose-down attitude. This really makes landing approaches easy. I was curious about the use of split flaps (this was my first experience with them on a glider), so I looked them up in Martin Simon's book on model aerodynamics. Sure enough, Martin states that split flaps create high drag without producing high lift, and this causes a nose-down attitude. After flying Jim's T'Tse, I think I'll try a model with split flaps.

If you have an interesting model and would like to see it featured as "Model of the Month," send a couple of black-and-white photos and a description to "Quiet Flight."

CSS First Annual Electric Fun Fly

I received a letter from Lyn Perry and Roman Paryz (photographer) of the Clarence Sailplane Society of East Aurora, NY, regarding their first electric event. We don't hear about too many electric contests and fun flys, but these events may well end up being "Astro Champs" or the "KRC Electric Fly-In." As Lyn put it: "Thirty CSS members, well-wishers and interested members of the Western New York modeling community convened at our sod-farm flying site on a windy August 30 for what we hope will be the first in a series of

Ron Kirk and his trusty Viking. Ron won "Longest Flight of the Day" honors with his alternate airplane, a Leisure Playboy, by getting four motor runs from one charging.

"electricfests." Despite the gusty 16mph wind, 12 electrics turned out, turned on and flew throughout the day.

"Three major types of airplane were present: powered sailplanes, old-timers and an electric Cub. Apart from one 035 cobalt-motivated Gentle Lady, all had 05 motors, roughly divided between cobalt and ferrite types. Batteries were 5-, 6- and 7-cell 800mAh or 1,200mAh packs. The average modeler in our area seems to have found success with a 2-meter wing and an 05 motor of some kind. It's also interesting to note that most electrics are flown locally by sailplaners, who perhaps are more in harmony with electrics' silent ways and flight characteristics than are our 'power' cousins.

"'Pilot's Choice' and 'Longest Flight of the Day' trophies were awarded during the Fun-Fly. After two tied ballots, 'Pilot's Choice' went to Mike Dezik's red, white, and blue Goldberg* Electra, which had an Astro* 05 geared cobalt swinging a Windsor* 12x8 folder. (This plane flew for 58 minutes on its first flight only a few weeks earlier!) However, 'Longest Flight' honors went to old-timer Ron Kirk (AMA No. 195) flying a Leisure Playboy with a geared Leisure 05 and 11x7 re-worked prop.

Jim Stevens and his original-design TTse 11C. A beautiful model, especially when you consider its all-wood, conventional structure.

Mike Dezik receiving the "Pilot's Choice" award from Fun Fly Director and club Secretary Lyn Perry for his Astro cobalt 05-powered Goldberg Electra. Beautiful workmanship.

"Ron put up a good early flight of 9 minutes, 26 seconds into the wind with his Astro Viking (Astro 05 geared cobalt, 7-cell pack), and sat on his time while others tried unsuccessfully to beat him. After lunch, the wind dropped slightly, and Mike Vitale's Electra (stock motor, 5-cell 1,200mAh pack) flew for 10 minutes, 22 seconds. Fierce competition at the *fun*-fly! Another Electra (stock motor, 7-cell 800mAh pack), flown by Tim Krystaf, promptly soared for 15 minutes, 1 second, so the call went out for Ron to charge up again! He brought his Playboy (not his Viking) to the line, launched and flew through four motor runs to a winning time of 17 minutes, 21 seconds.

"Many commented on how good it was to have a day devoted to electrics, instead of just having one or two people flying them in a forgotten corner of the field. Lots of 'hangar flying' went on in the pits, with groups of four or five people often seen bent over a plane discussing just 'how to do it' with regards to props, wiring, charging and so on.

"We regarded it as a good first showing, and plan to be bigger and better next year, while still emphasizing the *fun* of electric flying."

Thanks for the report, Lyn. It sounds as though everyone really enjoyed the virtues of a "quiet" fun-fly. The CSS has set this year's event for Sunday, September 11. If you're interested in attending, contact F.A. Perry Jr., 123 Park Place, East Aurora, NY 14052.

Eppler Translation

If, like me, you don't really understand all the tech charts that accompany airfoil information, then the next item will be of use. This piece by Colin Brichter came to me from the Clarence Sailplane Society's newsletter, the "Clarence Silent Flyer," but was originally published in the Tidewater Model Soaring Society's newsletter. It gives some basic information on various Eppler airfoils, in terms that can help you decide if a particular airfoil might be what you're looking for:

"EPPLER AUF ENGLISCH: The latest MTB 1/2 airfoil data book contains several new Eppler designs. However, most people can't read German, so we have to just 'look at the pictures' and hope for the best. I know a German mathematician who can be bribed with beer. Here are my attempts at translations of a few interesting passages from MTB 1/2, with thanks and a six-pack to Dr. Reiner Rebstock.

"PROFILES FOR R/C SOARING: All other Eppler airfoils have been designed primarily for sailplane models, although that doesn't mean that they can't be used for other purposes. Profiles E178, E180, E205, E211, E224, E374, E387 and E392 are applicable for somewhat faster models, e.g., in slope soaring. With regard to thermalling, the profiles E64, E174, E210, E214, E216 and E385 are appropriate. For larger models with

Mike Vitale launching Mike Dezik's award-winning Goldberg Electra. Wasn't a good day for sailplanes, however, as the old-timer designs prevailed in the "Longest Flight" category.

wingspans of at least four meters (which result in somewhat thicker wings), three profile 'Straks' (families of profiles) have been calculated. The first option consists of E197 at the root, followed by E195 for the inboard quarter and E193 for the largest part of the wing. The second concept uses E203 at the root, followed by E201 and E193. This design favors profiles with a little more camber and therefore larger moment coefficients. Consequently, slightly larger horizontal tails should be provided. The latest family

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SPORTSTER 90/120

(Continued from page 79)

These two problems prompted me to call Great Planes, and I spoke to Jim Schmidt, of their R & D department. Having been responsible for the development of the SS 90/120 kit, Jim was most helpful and quickly grasped the problem of stringer lengths for the .90-sized-engine version. He will correct the drawings and parts sizes in future production runs. He's also modifying the specs on the balsa sheeting over the hood. Most manufacturers don't bother to change their drawings or their manuals, but instead provide a little correction notice on a loose slip of paper somewhere in the kit box. Great Planes impressed me tremendously with its commitment to quality.

After the fuse had been completed, all parts were carefully sanded to prepare for covering. The fin and stabilizer were glued to the fuse prior to covering, and a solid epoxy connection was made. For my SS 90/120, I used Goldberg's Ultracote* for the first time, and my opinions about it are mixed. The final covering result was good. The surfaces are smooth and wrinkle-free, the Ultracote adheres well, both to wood and to itself, and the material is strong. It has excellent opacity, and it hides many building secrets. The material is bubble-free over solid sheeting, and I was happy with the results, after laying the sunburst pattern strips over the base sheets. The main drawback of the Ultracote is that it seems very heavy, and that extra weight demanded a lot of extra muscle, as well as a great deal of heat, to force it to the desired contours.

PERFORMANCE: To prepare the plane for flight, the final fit-out of radio, engine, servos, pushrods, etc., is followed by a check of the balance to the specified point and by a check of control throws. All these came out exactly as called for in the manual; the kit goes together beautifully if you follow instructions.

Now came a period of inactivity while I awaited a break in our Connecticut winter weather. Because the SS 90/120 is outfitted with small wheels and long, slender wheel pants, I wanted a smooth runway for my maiden flight. I invited fellow club member, Dave Baron to be the test pilot and, at his urging, we went to a large, smooth, frozen lake for our test mission. Conditions were ideal: 15 inches of ice, covered by one inch of very smooth, hard snow on the lake, and calm sunny skies. Dave is a super pilot, and he methodically proceeded to develop a pattern of performance with the plane. It performed Dave's entire repertoire like a real champion.

Editor's note: I'm not sure what Dave's "entire repertoire" consists of, but the "Connecticut winter weather" Dick spoke about is what gave me the opportunity to fly the SS 90/120 myself. While Dick's photos were usable, the Sportster deserved some nice flight shots showing its attractive scheme against a blue sky. Dick (reluctantly, I'm sure) loaned me the airplane, which I took to my field with Nick Ziroli Jr. We both flew the big bird, and in spite of some strong, blustery winds, it handled beautifully. The O.S. up front provided more than adequate power and, in fact, would hold the airplane vertical for about as long as you'd care to do so. It will do any maneuver the sport flier could want—all of them gracefully. Dick had advised me about the forthcoming mod, so we refrained from any really violent input, like snaps,

square loops or avalanches, but the Sportster looked so good performing the smooth loops, rolls and stall turns that we felt no real need to "push" the airframe. Landings are very gentle, and the gear location, in spite of being a tail-dragger, will make even the newer, low-time flier look good. We thoroughly enjoyed the airplane.

I have a sequel to this, and I'd like to share it with you. Great Planes has learned of two incidents with the SS 90/120 in which the fin/rudder came off in flight. The factory produced just over 1,000 kits in its first production run, and they have now tracked down all the purchasers of that batch. A "factory recall" is being prepared to tell each owner how to properly reinforce the tail. Again, I'm impressed with the superior product responsibility demonstrated by Great Planes.

Airworthiness Directive

Within the past few days, I've received from Great Planes a notification and modification package of parts and instructions that are required for the SS 90/120. There are now four reported incidents of tail failure on the kit, and G.P. has gone to great lengths to discover why and to overcome the problem. They have concluded that the cause in each case was tail flutter, and that the builders didn't follow instructions in certain critical matters.

The building manual for the kit stresses the following items in order to avoid tail flutter:

- Use the large molded-nylon hinges supplied in the kit.
- Use the heavy wire pushrods encased in nylon sleeves as supplied in the kit.
- Maintain a minimum gap at the hinge lines (not more than 1/32 inch).

These are *essential*, and *must not* be disregarded.

The recommended modifications include the removal of a panel of balsa sheeting on the bottom of the fuse and the installation of two bands of fiberglass tape inside the fuse. When dry, a small plywood block is then epoxied at one of these two fiberglass bands. Finally, two No. 6x¾-inch screws are inserted up from the bottom and into hardwood braces, which are a part of the horizontal stabilizer. When these reinforcements are complete, the balsa sheeting panel is replaced, and a patch of appropriate covering is applied to seal it up.

The Great Planes people are anxious that all who own the SS 90/120 kit, or the complete plane, are made aware of the need to observe sound modeling techniques and to follow instructions to minimize the chances of flutter. I'd like to add that their "mod package" neglects to caution the builder to check the plane's balance again, since these reinforcements at the tail do add weight back there.

In the meantime, I continue to enjoy flying my SS 90/120 tremendously. Even though I followed instructions for building it very carefully, and have had no indication of tail flutter, I shall alter the fuse at the tail as suggested, to benefit from the experience of others. I trust you'll do likewise.

My article is rather long, but when you're enthusiastic about something, it's sometimes hard to stem the flow. I'm sure that if *you* try the Super Sportster 90/120, you'll find as much as I did to be enthusiastic about.

(Continued on page 96)

Product News

JET MODEL PRODUCTS

Jet Model Products has announced the release of the Starfire II. The updated version features a fiberglass fuselage, intake duct, inlet leading edges, preformed fiberglass tailpipe and separately molded top-access hatch. Plywood formers and bulkheads are cut, along with wing, stabilizer and vertical-fin balsa leading-edge and trailing-edge laminations. All flying surfaces are factory-sheeted and have landing-gear plates installed with lightening holes and spar slots pre-cut. The kit is designed for use with a Dynamax I Fan System, O.S. .77 ducted-fan engine with tuned pipe and MK-10 retract gear.

For more information, contact Jet Model Products, 304 Silvertop, Raymore, MO 64083.

GREAT PLANES

The new Kyosho Impulse II is a tough, high-quality radio that's designed to give airplane modelers a superior, economical alternative in 2-channel, 2-stick radios. The Impulse II features a tough molded transmitter, smooth responsive gimbals, servo reversing, and a charging jack for optional transmitter batteries. It comes with transmitter, receiver, two servos, BEC switch harness, battery box and other assorted accessories.

For more information, contact Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

ALTECH MARKETING

Enya introduces two new high-power GP60XF-4 and GP60XF-4H engines. Both aerobatic pilots and helicopter jockeys will appreciate the extraordinary performance features of these engines.

The "GP" in the name stands for Gear Pump, which heralds a new era in Enya power and reliability. These side-exhaust engines use a special, metal, gear-driven fuel pump that's easier to hook up to a fuel tank than many other pumps are; just connect one line from the fuel-tank pickup to the pump. A special pressure-control valve acts as an excess fuel pressure bypass that goes back through the pump. The bypass circuit also helps diffuse the inevitable air bubbles in the fuel line caused by the pump, so protecting the engine from a lean mixture.

For more information, contact Altech Marketing, P.O. Box 286, Fords, NJ 08863.

CRESSLINE MODEL PRODS.

Cressline Model Products announces the latest addition to their Ducted Fan Jet Kits—the F-100 Super Sabre.

The Gary Mueller design is 1/8.6-scale with optional scale features such as work-as working flaps, dive brake, drop tanks or drag chute. Construction features follow the successful Cressline F-20 Tigershark and Saab Viggen kits with fiberglass fuselage, foam-core wings, molded inlet/exhaust liners.

For more information, contact Cressline Model Products, W239 N1690 Busse Rd., Waukesha, WI 53188.

RON CHARLES & ASSOCS.

Create and custom-design models and parts with the Vac-U-Form vacuum-forming machine. Each unit is constructed of durable steel and will mold all types of plastics, including Lexan and ABS plastic. The unit (available in standard and deluxe versions) features a 7½x10¾-inch working surface with a 9x12-inch maximum material size and two 660-watt replaceable heating elements.

For more information, contact Ron Charles & Associates, P.O. Box 805, Wilmette, IL 60091.

WENDELL HOSTETLER'S PLANS

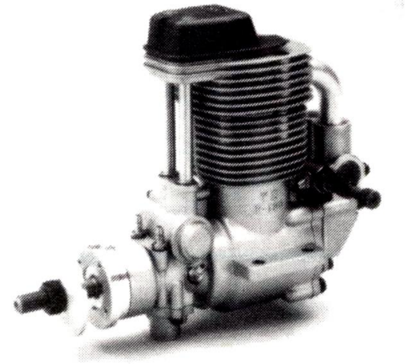
Wendell Hostetler's Plans proudly announces the introduction of its latest design, the Fairchild PT-19. The detailed plans feature traditional box construction with balsa, basswood (or spruce) and ply. The model includes a three-piece wing and removable tail feathers for ease of transportation in any compact hatchback car. The PT-19 is a 26 percent scale model with a fuselage length of 85 inches, a wingspan of 9 feet, 6 inches and 1,965 square inches of wing area. When powered by a 2- to 3-cubic-inch engine, the weight is approximately 24 to 26 pounds, with a wing loading of 30 ounces per square foot. Sources of documentation and three-view drawings are listed on the 42x96-inch sheets. Special cowl, oleo landing-gear struts and custom kits are available.

For more information, contact Wendell Hostetler's Plans, 1041 Heatherwood Ln., Orrville, OH 44667.

RC VIDEO MAGAZINE

RC Video Magazine has just released its latest tape, Volume 10. The contents are: "Southwest Fan Fly, 1987 Scale Masters, Byron's B-29, Scale Detailing by Dave Platt" and "AMA Working for You." Viewers say this is the best issue yet. See for yourself!

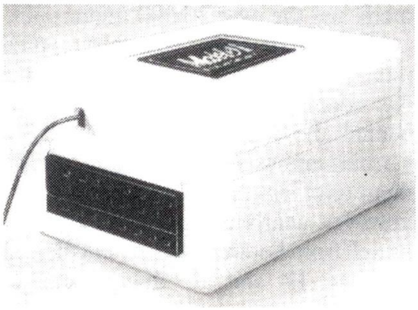
For more information, contact RC Video Magazine, 1200 Diamond Cir., Unit J, Lafayette, CO 80026.



FUTABA ENGINES

Destined for greatness, the new YS.Futaba 120FS is a true model engine tour de force. At 19.96cc, the 120FS is the largest displacement legal for F3A competition. To give YS.Futaba fliers maximum power advantage, the 120FS combines 4-cycle design, integrated fuel injection and supercharging. In addition to increased power output throughout the rpm range, the 120FS performs superbly during steep climbing or inverted flight and isn't susceptible to 4-cycle detonation.

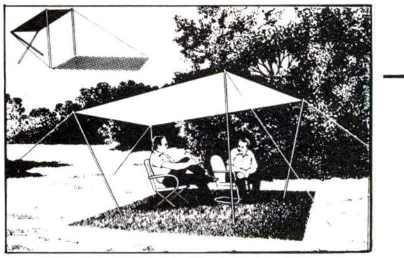
For more information, contact YS Futaba Engines, 555 West Victoria St., Compton, CA 90220.



ACE R/C INC.

The Ace R/C Model 91 is an outstanding receiver that has been tested, revised, updated and improved to the point where we're confident that it's as good as it can be and will always work as it should. It works with any modern AM transmitter and operates any modern positive-pulse, three-wire servo, from 1- to 7-channel operation. This unit has been flight-tested over the past two years in a simulated 1991 environment.

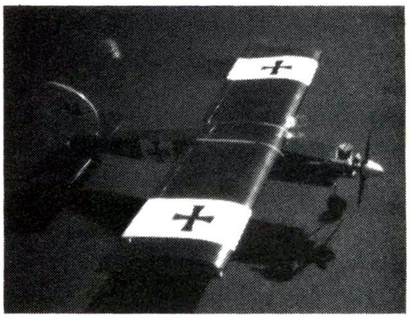
For more information, contact Ace R/C Inc., 116 West 19th St., P.O. Box 511, Higginsville, MO 64037.



THE FOUR "M" COMPANY

The Sportsman Porta-Shade has been developed to provide shade for modelers and their equipment. These canopies, which are available in 6x10-foot, 9x10-foot and 9x18-foot sizes, feature a laminated opaque fabric in white or silver (for heat reflection) with riveted keyhole corner fasteners for quick and secure attachment to the 1-inch-diameter aluminum poles. Porta-Shade has also developed a Trak-Lok-Eye kit enabling the use of Porta-Shade as an awning on camper trailers or R/Vs.

For more information, contact The Four "M" Company, 209 S.W. Bucy Ave., Bartlesville, OK 74003.



INDIANA HOBBY DIST.

The ARF Perfect Stix from Indiana Hobby Distributors has a 54-inch wingspan and is covered with Carl Goldberg Ultracote pinstriping and decals in the classic Red Baron colors. The fuselage has preinstalled wing seating tape and pushrod exits, as well as pre-drilled holes in the main landing gear. The Perfect Stix can take a .40 to .51 4-cycle engine or a .50 to .65 4-cycle engine, and it's ready to fly at 4½ pounds.

For more information, contact Indiana Hobby Distributors, 528 Main St., Beech Grove, IN 46107.

SPORTSTER 90/120

(Continued from page 91)

**Here are the addresses of the companies mentioned in this article:*

Great Planes Model Manufacturing Co., P.O. Box 721, Urbana, IL 61801.

Futaba Corporation of America, 555 W. Victoria St., Compton, CA 90220.

Carl Goldberg Models Inc., 4734 West Chicago Ave., Chicago, IL 60651.

CORSAIR

(Continued from page 66)

propeller are hard to miss, as is the large airscoop on top of the cowling. After the first airplane was built, they went one step further and introduced a Mustang-type bubble cockpit, and that's the F2G that everyone knows best.

Most of the time, these airplanes are referred to as "Corncob Corsairs" because of the engine's winding *four rows* of cylinders, which created the corncob appearance.

Post-War Corsairs

The last Corsair was delivered in mid-1953. By that time, countries around the world, as well as our own armed forces, had turned to the old bent-wing bird as a ground-pounder. The Navy/Marines had a heavily armor-plated version built (the AU-1), and an export model (sometimes designated F4U-7) was also produced. These airplanes have a double air inlet on the cowl lip.

During the post-war period, the Corsair was the only World War II-type to continue in large-scale production. It did so many things so well, there just wasn't anything to replace it. In fact, some countries didn't *try* to replace it until well into the '70s.

I've given the Corsair a quick broad-brush treatment, because it would take a book the size of the Manhattan (NY, not KS) phone book to list all the 981 major mods and the over 20,000 minor ones.

In the very early '70s, there weren't more than two or three viable Corsairs in the country. The airplane lagged far behind the Mustang in popularity, so warbird enthusiasts didn't start restoring them until less than a decade ago. Now, however, nearly a dozen have been imported from South America, and there are between 12 and 15 flying examples. Every major airshow has at least one.

For several reasons, every modeler thinking of building a model of a true Corsair should seek out a full-scale Corsair. First: Without having actually stood next to the airplane, it's impossible to feel the texture and form that is so much a part of it. It reaches out and leaves more of an impression than any airplane of its era. Second: Until you've stood next to one, there's no feeling of scale. A model of a Corsair feels like a model of a Mustang, which is like a ...! You won't fully appreciate the Corsair until you've visited the real thing. The Corsair is *huge!* Not big. *Huge!* The wing root is above head level, and standing on tiptoes still leaves you several feet short of touching the canopy rails.

Building a model is a personal attempt to experience a little of a bygone airplane, but that model will mean so much more if you've actually been around the real machine—and it *is* a *real* machine; make no mistake about it.

FLOAT. AROUND

(Continued from page 82)

retracts, which raise and lower the wing-tip floats. There are hundreds of other tasks (too numerous to mention here) that are necessary to bring a project like this to completion. I'll just say that Gary glassed the entire airframe with ¾-ounce cloth, primed and painted the PBY and then waited three agonizing weeks until the weather cleared for the first test flight.

Transporting a 9-foot PBY Catalina to a flying site and setting it up is an event in itself. Gary bought a cheap folding table, on which he assembled the plane near the shore. The PBY's radio is a J.R.* Unlimited 8 scale-type, which has in-flight sync and separate idle capability. The starting procedure involves starting one engine, peaking it out, returning it to idle, and then repeating the cycle with the other engine. When both engines are at idle, they're brought up together for sync. It's not a complicated procedure, and the reward is the sound of the twins singing in unison.

With all systems running, Gary discovered that the jackscrew was driving the servos wild during cycle. After shutting down and thinking about it, he decided to fly with the tip floats down. The weather for the first flight was sunny, with 5mph winds and two inches of small chop. The hardest job the 60s have is dragging the hull up to step. They're hampered somewhat by the prop's proximity to the water, but after a couple of blasts of spray, the PBY gets loose and starts planing. Once on step, slight back pressure gets that big wing lifting, and the climb is impressive.

While everyone was cheering, Gary was having a less than comfortable time with the plane. His impressions after the two flights on that first day were that the CG, at 33 percent, was too far back and that the plane was out of balance from tip to tip. During the week, he moved the CG forward to 25 percent and added two ounces to the right wing tip to correct lateral balance. Gary also ripped the jackscrew out and installed Rhom-Air* retracts with spring assists in each wing tip.

The second flying session found Gary breathing more easily. The PBY tracked like a pattern plane with the CG forward. With twin 60s, it's capable of very high speeds, and it looks best at half throttle. At this point, Gary plans to get more familiar with the plane before trying upscale maneuvers, but the suspicion is that the plane would easily do an impressive split "S" and a hair-raising victory roll for starters.

Landings are tricky. The PBY is fast in ground effect, hates to stop flying and balloons easily, trying to flare before its time. As well as this, the wings have to be kept absolutely level to avoid digging in a tip float, so beginners should be cautious. This is a project for a modeler who has *at least* average modeling and flying skills. With hundreds of hours and dollars on the line, it's too much, both emotionally and physically, for the beginner to handle.

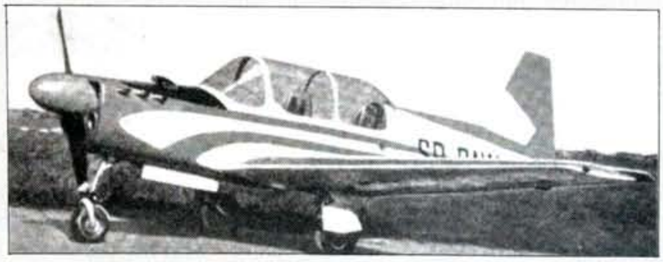
Bill Price is a "shop" teacher at a local college, and his approach to modeling the PBY reflects the media he's comfortable with. Bill's version of the PBY was sized to accommodate twin O.S. 40s, swinging Master Airscrew* 9-6 props with 6-ounce Sullivan tanks accessible under high-impact styrene cowls and nacelles. The 48-inch fuselage, pylon and vertical stab unit is hand-laid glass and polyester resin, and features clear acetate cockpits and gun blisters. The rudder is the only built-up component on the plane with the horizontal stab, elevator and one-piece

(Continued on page 104)

NAME THE PLANE CONTEST

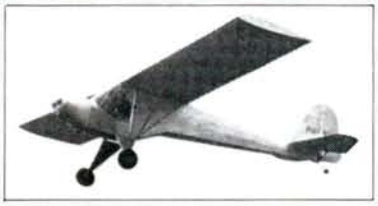
Can you identify this aircraft?

If so, send your answer to **Model Airplane News,** Name the Plane Contest (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.



Congratulations to Jim Freese of Ukiah, CA, for correctly identifying the Hollandair HA-001 Libel, single-seat Ag plane built in the Netherlands. Surprisingly, only six people submitted the correct answer, and we drew the winner from these. A lot of the incorrect answers identified the bird as the Kitfox or Avid Flyer, both current home-built kit planes.

The Libel is powered by a Lycoming 0-290, has a wingspan of almost 50 feet and is equipped with two 33.3 Imperial gallon tanks for spraying. It was first flown in August, 1957.



The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail and will receive a free one-year subscription to Model Airplane News. If already a subscriber, the winner will receive a free one-year extension of his subscription.

FLOAT. AROUND

(Continued from page 101)

78-inch wing fabricated from 1/16-inch balsa-sheeted cores. Bill has engineered the wing to contain interlocking ply spars, nacelle and pylon reinforcement-plates and firewalls, which, when epoxied together with the hot-wired foam components and then sheeted, form an almost bulletproof wing.

When I talked to Bill recently, he had his PBY painted and equipped, with only trim and numerals left to apply. The prototype Catalina then weighed 8 pounds, 7 ounces for a very tolerable 23-ounce wing loading. Following Emerson's lead, Bill stuffed all the radio gear into the nose to establish the CG at 25 percent. Stick inputs are handled by six servos; one for each engine, plus aileron, rudder, elevator and spring-air retracts for tip floats. This PBY has one deviation from scale, as the tip floats are slightly oversize and have a pronounced rake to prevent digging in. From the reports I've heard about the problem, I can tell you this is a great idea.

Bill has installed one other neat item in his PBY that's worth mentioning. It's a CK Ventures Mixer* that allows rudder control to raise and lower the appropriate engine at idle, or at taxi speeds. This obviates the need for a water rudder, and it will enable Bill to steer the PBY on the water, just like the full-scale version. At higher speeds, the engines are brought into sync with rudder trim, and all of this can be adjusted and set up before taking to the water. The kit version will also contain landing-gear wire for ground operation, and there are recessed wheel wells molded in the fuselage for those of you who are talented enough to go for retractable landing gear.

Bill's prototype will be finished with a silver top, white bottom, orange trim and numerals, and on the rudder there will be invasion stripes, which will match those of the 1948 Air Force units based in San Francisco. Color schemes were taken from Squadron Publications'* book on the PBY. I'll have shots of Bill's completed PBY in a future column, along with a flight report, but I've included his company's name and address at the end of this column, so that you can contact him for prices and availability. Bill is also planning to kit a 78-inch Grumman Albatross for twin 40s, and this will be a welcome addition to the amphibians available now.

Float flying is increasingly popular. Nearly 10 percent of the planes at the Puyallup, WA, show were on floats. *Model Airplane News* will have a complete report on Clearlake '88 in the September issue, along with more float articles and information. Don't miss it!

**Here are the addresses of the companies mentioned in this article:*

Bill Price, c/o G&P Sales, 410 College Ave., Angwin, CA 94508.

Tower Hobbies, 1608 Interstate Dr., P.O. Box 778, Champaign, IL 61820.

Sid Morgan Vintage R/C Plans, 13157 Ormond Dr., Belleville, MI 48111.

Hayes Products, 2610 Croddy Way, Unit A, Santa Ana, CA 92704.

Carl Goldberg Models, Inc., 4734 W. Chicago Ave., Chicago, IL 60651.

J.R. Radio; distributed by Circus Hobbies, 3132 S. Highland Dr., Las Vegas, NV 89109.

Rhom-Air Products, 924 65th St., Brooklyn, NY 11219.

Master Airscrew; distributed by Windsor Propeller Co., 384 Tesconi Ct., Santa Rosa, CA 95401.

C&K Ventures, 1807 Park, Laramie, WY 82070.

Squadron Publications, 1115 Crowley Dr., Carrollton, TX 75011-5010.

SLOPE SOARER

(Continued from page 43)

PERFORMANCE: With a flying weight of 53 ounces and a wing loading of 17.5 ounces to the square foot, it was obvious that the F-16 was going to need a pretty good wind to fly. On the first trip to the slope, the wind was about 10mph and blowing directly onto the face of the hill. There were a couple of other gliders in the air, and conditions looked OK. *Wrong!* On my local slope, 10mph wasn't going to cut it. The first toss ended at the bottom of the hill in tall weeds. However, that first glide showed me that the model was controllable, but slightly nose-heavy.

After removing an ounce or so of lead, I decided to give it one more try. *Wrong again!* If conditions aren't right, *go home!* The F-16 again glided to the bottom of the hill, and this time I managed a less-than-perfect landing that cracked the fuselage near the nose. The crack went about half-way around the fuselage, and about half-way through the foam. The crack was too small and tight to get glue in, so I left it alone, thinking it would break completely after a couple more landings, and so be easier to repair.

On the second outing, with more wind and at a slightly better slope, I had my first successful flights. This time, the wind was blowing about 15mph directly onto the slope, with gusts of about 18mph. The F-16 moved out steadily from the hill and started to pick up speed as I dropped the nose slightly. A few passes up and down the slope showed that the model was very groovy in the turns, but a bit pitch-sensitive. This is probably due to the very short tail moment and the very long nose moment.

The model reached a good speed, so I was ready to try some aerobatics. The first roll caught me off-guard; the airfoil has a flat bottom, and I expected the roll to be fairly slow. However, the roll rate is quite fast, with almost no "down" required when inverted. Because the F-16 is fast, it's only necessary to drop the nose slightly to gain enough speed to do rolls. The wind never picked up sufficiently to give me enough confidence to try inverted flight. In high-enough wind conditions, the F-16 *might* fly inverted, but I wouldn't expect too much from the flat-bottom section.

Because of its high wing loading, on the back side of the hill, the F-16 cuts through the wind easily. This makes landings a little easier than with some of the lighter ships, but it also means higher landing speeds. Surprisingly, the cracked fuselage has held up during subsequent flights, and I'll probably have to wait some time before it breaks.

My only complaints are that the model is rather heavy, and that, as a foam model, it's prone to minor damage from normal flying. Most slope sites don't have a well-groomed landing area, and almost every landing produced dings and dents in the wing and fuselage.

A Combat Models F-16 jet fighter will get you into the air quickly and will add a new dimension to your slope-flying enjoyment. It requires proficiency with ailerons, but it isn't really that hard to handle. With its high wing loading, it requires relatively high winds to fly, but this is where it really shines. The higher the wind, the more the F-16 is capable of. When the wind blows really hard and

(Continued on page 107)

SLOPE SOARER

(Continued from page 105)

others are grounded, that's when you and your F-16 will show everyone else what being a jet jockey is all about!

**Here are the addresses of the companies mentioned in this article:*

Combat Models, 2128 48th Ct., San Bernardino, CA 92407.

Pactra (Plasti-Kote), 410 N. Michigan Ave., Rm. 1280, Chicago, IL 60611.

Flite Kote; distributed by Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728.

Cirrus; distributed by Hobby Shack. ■

GMP CORSAIR

(Continued from page 50)

The front end of the plane contains a large firewall, but remember, we're messing with an aircraft which is almost 1/5 scale. An O.S. Max 1.08 FSR from Great Planes* was installed on this plateau of the nose. The Max 1.08 is not only a dependable powerplant, but is also recommended for this aircraft. Like the rest of the O.S. line, the 1.08 features ABC technology with twin ball bearings on the crankshaft, Schneurle porting for power and the Max 7D carb with automatic mixture control. I had my doubts about whether this engine could provide enough thrust for the Corsair, considering its size, but the Max was up for the occasion. More on that later.

When the powerplant is in place, the ABS plastic cowling can be mounted. A plywood ring creates a mounting surface inside the cowling for a fit to the nose. The kit provides a bottle of special-formula CA for gluing ABS, and it's adequate for the job. I anticipated some earth-shattering vibrations from this large engine, so just to be on the safe side, I reinforced the cowling ring with a layer of 2-ounce cloth. For a scale effect, I cut slots in the cowling to simulate the cowl flaps. That worked very well, and also provided an exit area for hot air. I recommend this.

The cockpit was the last item to get my attention. In order to appear closer to scale, it required more cutting than the kit had provided. No big deal; besides, it also allowed more room to work out the cockpit details. Speaking of which, I included a military pilot figure that looks just right.

The Corsair is now basically finished, except for one detail I had to add. The kit doesn't call for retracts, yet it has the main gear doors cut out and left open. This means that there are huge holes in each wing into which the main gears should tuck, but they don't.

I couldn't have that, so I installed Rhom-Air* 90-degree rotational retracts to the wings. These are pneumatic retracts that have proven their reliability over the years. Installation required some modification to the wing inside the gear bay, but it was worth the effort. By the way; on this big bird, use the Rhom-Air units with 3/16-inch struts to carry the load. The

GMP CORSAIR

operation of these units was flawless.

To complete the assortment of provided goodies, GM added a retractable tailwheel assembly complete with a retractable tail hook. Making all this retract equipment work was no easy task, but with the help of another builder (Danny Gayhart) who did most of the finish and the retract hookup, I made the gear and the doors fully operational.

The Corsair was finished with a layer of ¾-ounce glass cloth over the wings, sanded and then primed with RM water-based primer. On top of this was a color coat of K&B* epoxy paint using a satin-finish catalyst. Then the whole ship was hit with a swat of steel wool for a slightly weathered effect. Completing the paint scheme were the kit-supplied decals, showing the numbers of Pappy Boyington's bird.

The radio we used was the top-notch Futaba* PCM radio. With so much work put into this bird, I wanted to guide it with something I could trust. That guidance required eight servos to bring the Corsair to life, including one for the tail hook and tail retract.

Harnessing the brute power and noise of the O.S. Max 1.08 was a Slimline Manufacturing* Pitts-style muffler. This muffler allowed us to vent the fire down and out of the cowling on the Corsair, while keeping the noise down. There was no need to cut any portion of the cowl due to the machined-aluminum Slimline muffler that fit well within the confines of the cowl.

The Corsair came in tail-heavy and required 18 ounces of solid lead in the nose to achieve balance. The final ready-to-fly weight was 15 pounds. Spread this out over the 920 square inches of wing area, and you have a pretty respectable wing loading. With final check-out complete, I headed for the runway.

PERFORMANCE: I admit I was apprehensive about the ability of the 1.08 to lift this big ship until the engine was brought to life during break-in. Swinging a 16-6 prop at a tad over 9,000rpm, we had to strain to hold the Corsair back. After a thorough pre-flight check, the Max 1.08 was brought to full throttle. Boy, was the first lift-off great! At only half throttle, the Corsair took off.

My pilot, Danny, describes the bird as superbly solid. In his words, "the best scale aircraft I have yet to handle." The elevator response was very solid in all flight attitudes and speeds, providing some feather-light landings. Ailerons were positive, with no wandering about the roll axis. Rudder was effective enough to stop the "Dutch roll" tendency that many Corsair models display. And the power came from the engine room in bundles! Realistic-looking loops that were big and spectacular were the norm. This performance was totally unexpected.

(Continued on page 110)

Classified

WANTED: RTF U-Control planes from Cox, WenMac, Comet, Aurora, Testors, etc., complete or pieces, buy or trade. John Fietze, P.O. Box 593, Lynbrook, NY 11563.

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; (918) 245-3649.

WANTED: Model engines made before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657.

SCALE DOCUMENTATION: Plan Enlarging. Photo packs, 3-view drawings for 1,600 aircraft. Super-scale R/C plans for Giant, Sport. 60-page catalog $3. Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; (919) 292-5239.

BUILD AND MAINTAIN YOUR OWN ELECTRONICS. Battery cycler, constant current charger, digital ESV, etc. Radio Shack parts. Very complete instructions for the non-electronics person. Satisfaction guaranteed. Business size SASE for information. Lico Electronics, 700 NW 7th Ave., Boca Raton, FL 33486.

CUSTOM EMBROIDERED PATCHES. Your design made any size, shape, colors. Five patch minimum. Free random sample and brochure. Hein Specialties. 4202K North Drake, Chicago, IL 60618-1113.

BEGINNERS, discouraged by too-fast "trainers"? Send $1 and two stamps for no-holds-barred evaluation of over 20 popular R/C trainers rated for their ease-of-flying. Jim Waterman, 3818 Deerfield Dr., San Antonio, TX 78218.

PLANS ENLARGED, Model Drafting Software, Ni-Cd Monitoring Software, PC Servo Tester. Free catalog. Concept, PO Box 669E, Poway, CA 92064; (619) 486-2464.

WANTED: Berkeley and Cleveland kits or related items: parts, plans, boxes, brochures, books, ads, radio equipment, accessories, etc. Gordon Blume, 4649-191st Ave. S.E., Issaquah, WA 98027.

TORQUE STANDS: Measure engine horsepower .049 to .60 or .15 to 1.2. Precision machined from bar stock, adjustable engine mount, $300 or $385. For ¼-scale plane and car engines measure up to 5 horsepower at 8,000rpm, $750. Postpaid U.S.A. Armstrong Research & Technology, 2123 4th Avenue North, Irondale, AL 35210.

REMOTE, NEEDLE-VALVE ADJUSTER: Allows exact needle adjustment for every flight. Precision gear train makes it easy to set engine for peak power. Adjuster knob 2 inches from prop. Complete mounting hardware and adapters for bent or knob-type needles for .19 to 1.8 engines. $16.95 post-paid check or M.O. S.&D. Model Products, P.O. Box 4026, Des Plaines, IL 60016.

PLANES, BOATS AND CAR KITS below list price. Also available: Bearings, radios, hardware, and a complete line of accessories. We keep prices at ROCK BOTTOM. For catalog write: SOUTHINGTON HOBBIES, P.O. Box 819, Southington, CT 06489.

"LEARNING TO FLY R/C With or Without An Instructor," $2.95 plus 56¢ postage. Jim Waterman, 3818 Deerfield Dr., San Antonio, TX 78218.

WANTED: One Astro Flight gear for belt drive system, 18 teeth. Any reasonable offer accepted. ($5-$10). Call collect for Carey Simon, 4pm-8pm central time. Please call as fast as possible. 4521 Lorraine, Dallas, TX 75205.

AVIATION RESEARCHER'S BOOK CATALOG Fully Indexed. 1001 entries. Send $2 for your copy today. Greiner Associates, 16-N Mistuxet Ave., Mystic, CT 06355.

FREE VIDEO TAPE CATALOG: Over 100 videos oriented to modeling. Airplanes, trains, cars, how tos, also books. Kennykraft, 5665 Peninsula Rd., Florence, OR 97439.

WANTED: ⅕- and ¼-scale finely made model aircraft, scratch-built or kits, for displaying and/or flying. Gary Schonwald, 230 Park Ave., New York, NY 10169, (212) 490-8080.

SCALE MODELERS/AVIATION BUFFS/COLLECTORS Dimensioned scale drawings by William Wylam; all soft-bound in the "Scale Models" book. Features Grumman classics F2F and F3F; Seversky P-35 Waco "C" and "D" models; Wedell Williams Racer, plus other famous aircraft. Even includes detailed drawings of P&W Twin Wasp and Wright Whirlwind engines. Send $7.50 (postpaid) to. Air Age Publishing, Inc., 251 Danbury Rd., Wilton, CT 06897.

BRASS ROD, TUBING, SHEETS. X-Acto tools. Stainless steel and brass, screws and bolts. Small quantities, free catalog. Elwick, Dept. 688, 230 Woods Ln., Somerdale, NJ 08083.

JET ENGINES: Doylejet, Jet-X, Turbonique, ARV-5, and more. Supplies: Petal valves, spark plugs, ignition coils, Jet-X fuel. Plans: Brauner pulsejet, $19.50. Turbonique turbines, $45. Monthly builder's newsletter $12/yr. Latest copy, $1. Catalog $3. Doylejet, 4015 San Jacinto #404A, Houston, TX 77004.

WESTERN PLAN SERVICE. Specializing in Flying Wings. New Catalog $2. 5621 Michelle Dr., Torrance, CA 90503.

IMPORTED DIESEL ENGINES: Aurora, KMD, K-Mills, M.V.V.S., P.A.W., Pfeffer, Silver Swallow and Replica Taplin Twins. Also M.V.V.S., P.A.W., RADUGA and Silver Swallow Glow engines. $1 Catalog. CARLSON ENGINE IMPORTS, 814 East Marconi, Phoenix, AZ 85022.

ANTIQUE IGNITION ENGINE PARTS: Champion—Stitt—NGK Spark Plugs, Coils, etc. Timers, Points, Tanks, Needle Valves for most older engines. Catalog of "Quality" Reproduction Parts—$4 U.S.—$7 International (Air Mail). MICRO MODEL ENGINEERING, 1301 West Lafayette, Sturgis, MI 49091.

GIANT SCALE PLANS by Hostetler. We fly what we draw. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667.

MULTI-PACK CHARGER PLANS: Charges two 6- or 7-cell battery packs simultaneously in 15 minutes. Each pack is separately fused. Full metering, current and voltage. Build the basic charger for less than $7 from locally available parts. Parts list furnished. Send $5 to: CHARGER PLANS, P.O. Box 26913, Greece, NY 14626.

WANTED: Working Futaba receivers, 72.160MHz. Jim Bassett, P.O. Box 298, Toledo, WA 98591, (206) 864-2953.

Send ad and payment to *Model Airplane News,* 251 Danbury Rd., Wilton, CT 06897. **Non-Commercial classified ads** (commercial ads of any kind not accepted at this special rate). Rate: 15 words or less, $4.50 payable in advance. No charge for name and address. Additional words, 25¢ each. **Commercial classified ads** (rate applies to anyone selling on a commercial basis—retailers, manufacturers, etc.) Rate: 50¢ per word, payable in advance. Count all initials, numbers, name, address, city and state, zip and phone number. **Closing Date** for either type of ad is the 20th of the third preceding month (for example, January 20th for the April issue). We do not furnish box numbers. If you would like your ad to run in more than one issue, multiply amount of payment by number of months that ad is to run. It is not our policy to send sample copies of tear sheets.

Club of the Month

ST. PAUL RC CLUB

The Saint Paul Model Radio Controllers is the *Model Airplane News* "Club of the Month" for July 1988.

The S.P.R.C., under the guidance of President John Knoy, is a sizable club, with a membership of 105! Like many other clubs, S.P.R.C. members are gearing up to have their radio systems checked for the narrow band requirements of the AMA Silver and Gold Label program. Although existing radio systems don't have to comply with this regulation until 1991, in any AMA-sanctioned event, a contest director may require that radios "fly" the gold label. As the S.P.R.C. has recognized, the sooner their member's radios have been checked, the safer flying will be. The club is also making an effort to minimize the noise level of their flying machines; it's not uncommon to see a club lose its flying site because of excessive noise. It's nice to see clubs such as the S.P.R.C. practice noise control. This will guarantee that model-airplane flying will be around for years to come.

"Pulse," the newsletter of the S.P.R.C., is published monthly by Editor Lyle Peterson. "Pulse," contains information on past club meetings, future events, and notes from governing club members. When completing the club's application form, fliers are asked to provide information on their flying frequencies, the types of flying events preferred, etc. This is a bright idea, as the information obtained enables the club to serve its members even more efficiently.

We at *Model Airplane News* are pleased to award the Saint Paul Model Radio Controllers Club two free, one-year subscriptions, which may be given by them to a couple of the club's outstanding members. Congratulations! ■

Each month **Model Airplane News** will select the club newsletter that best shows the club's activities and energies directed toward the furtherance of the hobby. The award is not based on size or quality of the newsletter, and can be about any aspect of the hobby (F/F, C/L, R/C, boating, cars, etc.). **Model Airplane News** will award two free one-year subscriptions to be given by the club to outstanding junior members. So send your newsletter to **Model Airplane News,** Club of the Month Contest, 251 Danbury Rd., Wilton, CT 06897.

GMP CORSAIR

(Continued from page 108)

The Corsair was flown about five times on the first day, and each time it performed like a thoroughbred. The Futaba never skipped a beat, and the O.S. Max 1.08 hummed along nicely. You do have to keep some power to the aircraft on landing, or it slows up way too fast and tends to "plop" down. Overall, the GM Plastics Corsair is a worthy investment in a large-size warbird. If following the tradition of a true legend is what it's all about, the GM Plastics Corsair is right on target.

**Here are the addresses of the manufacturers mentioned in this article:*

GM Plastics, Inc., 7252 Industrial Park Blvd., Mentor, OH 44060.

Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

Rhom-Air Products, 924 65th St., Brooklyn, NY 11219.

K&B Manufacturing, 12152 Woodruff Ave., Downey, CA 90241.

Slimline Manufacturing, P.O. Box 3295, Scottsdale, AZ 85257.

Futaba Corp. of America, 555 W. Victoria St., Compton, CA 90220.

GIANT STEPS

(Continued from page 100)

crutch may run vertically through the center of the fuselage and have half-formers glued to both sides; or the crutch may lie horizontally in the fuselage and have upper and lower former halves glued to it.) This often means that the upper half-formers may be added to the crutch while the crutch is fastened to the building board, but the lower half-formers must be added off the board. This method requires some care to ensure that the formers are absolutely vertical (or at the appropriate angle) to the crutch.

The crutch provides a very strong (and usually very "true") basis for fuselage construction. It can add significant strength and reduce construction when compared to making stick fuselage sides, spacing them correctly and then adding numerous formers to provide the desired shape. As mentioned, care is required to build an accurate fuselage using this method.

Many years ago, Berkeley produced a line of small kits that used a unique method of construction for fuselages with compound shapes. They provided a section of cardboard mailing tube and an extra piece of ⅛-inch square balsa. You glued the balsa strip to the cardboard tube, carefully keeping it straight and

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GIANT STEPS

(Continued from page 110)

parallel to the edges of the tube. All the formers had a round hole in the center (the same size as the tube), as well as a notch which was a ⅛-inch square slot. Can you see where they were coming from? You simply cut out the formers with your shaped safety razor blade. (No die-crunch parts in those days; you got several printed sheets of appropriate-size balsa, and you cut all the shaped parts yourself, following the printed lines on the balsa. Sometimes, when the printing hadn't come through too well, you either had to use a lot of imagination to determine where the line was supposed to be or, when the print was really sloppy, you had to decide just where in the width of the line you'd do your cutting!)

When the formers had been cut out, you slid them onto the tube, and the ⅛-inch square strip acted as a "key" to position them correctly. Then you added the stringers to complete the basic fuselage structure. With a little luck and a lot of tender care, after removing the tube, you had a relatively strong fuselage. In addition, the hole through the center of the formers was used to string the rubber that powered the propeller. There were no CA glues then; glues were relatively slow in curing, and you'd get some strange shapes if things slipped a little while you were waiting for the glue to dry. Such slippage often tilted the formers slightly, making it *very* difficult to remove the tube without doing some damage. The good old days? Sure, but very few of us are anxious to go back to them!

The point of the story is this: Why not use the same method to build a large model? You could use a sturdy mailing tube as the "core" (something I intend to try) or a section of aluminum T-stock. The aluminum T could easily be mounted in a stand that would permit it to rotate. The advantages of being able to build a fuselage in this way (able to turn it as needed for construction) would be significant.

The opening in the formers would be triangular; this would be easy to cut and would fit snugly over the T stock. Once positioned correctly, the formers would be joined with stringers and whatever else had been designed into the structure. If desired, some of the sheeting could be added. The T stock would be rigid enough to hold the fuselage in proper shape until enough work had been done to maintain that shape and, finally, the T stock would be pulled out through the front former to be used again.

The method described would eliminate the need for the stick fuselage sides, cross members and formers. It would save considerable time over conventional construction practices, not to mention saving material and increasing one's ability to construct a straight and true fuselage every time.

I'm out of space for this month. In my fourth article on this, I'll complete the fuselage, discuss the details needed following completion of the plan and give you some convenient sources. ■

QUIET FLIGHT

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consists of E66 at the wing tip, followed by E67 and E68 for the inner part of a double trapezium wing. In all three cases, airfoil chord at the root should not be too small and should typically exceed 250mm. At the tip, the chord can be reduced to about 150mm, depending on wing loading.

"PROFILE CHARACTERISTICS (PART ONLY): The E193 profile is very well suited to all-around application. The critical Reynolds Number is 100,000 for this approximately 10-percent-thick airfoil. Originally designed for larger models with wingspans of more than three meters, it also proved useful in the F3B class, until it became possible to build wings sufficiently solid and stiff with thinner profiles. A combination of the profiles E197 and E195 (or the E203 and E201 for even larger models) at the wing root, with the E193 for the outboard part, permits construction of competitive wings for sailplanes with wingspans of about four meters. The necessary Reynolds Number is obtained, provided the airfoil chord is not less than 150mm at the tip and 300mm at the root.

"For R/C sailplane models, the E205 was devised. Initially, it was well suited to models of the F3B class, but now profiles with cambered flaps have become the norm, and these, due to their decreased thickness, may create less drag. However, this easy-to-build airfoil with its straight lower surface can be used for general purposes or for the on-and-off F3B flyer. It's also useful for slope soaring as it has low drag at high flight speeds.

"The E207 and E209, with their somewhat increased thickness, can be considered a continuation of the E205, although they're slightly less suitable for the higher speed regime. All three profiles are suitable for larger models. The E209 or the E207 would normally be used for the root profile, with the E205 for the outboard part. Since the zero-lift lines of all three profiles are about the same, no wing twist is necessary.

"The E211 and E212 are designed for lower Reynolds Numbers of 100,000 or more, and they can therefore also be used as outboard profiles for smaller wings (about 150mm chord). The 10.6-percent-thick E212 has a higher camber that results in a higher maximum lift coefficient. Both airfoils generate a relatively large pitching moment and therefore require larger horizontal tails. Both profiles are good for all-around purposes; the E211 is particularly suitable for high speeds, whereas the E212 is more suited to thermalling.

"The E214 has been developed by Professor Eppler as a profile to be used with camber-changing flaps. The flap depth should be 25 percent of the chord. Only an upward deflection for high-speed flights was initially intended, but experience has shown that positive deflections can also produce good results. The critical Reynolds Number is about 100,000, due to the relatively high thickness of 11.1 percent. The wing chord should be at least 180mm if the calculated performance is to be achieved. The flap deflection should be -5 degrees upward and no more than 10 degrees downward. Its high maximum lift coefficient makes this profile well suited to powered sailplanes or larger thermalling gliders.

"Since the canard configuration has been resurrected over the last few years in full-scale aircraft, model builders have expressed interest in this exotic design approach. This had led Professor Eppler to devise the profiles E210 and E216. The E216 is designed for the forward wing. It's distinguished by a particularly high lift-maximum coefficient (over 1.5), so it can also be used with certain large thermalling gliders. However, this high lift is paid for by a high pitching-moment coefficient of about -.21, which requires somewhat larger horizontal tails when used with "normal" layouts. The 13.6-percent-thick E210 is designed for the main wing (of a canard). Due to its gentle stall characteristics, it's also suitable for powered models.

"The two profiles—E220 and E221—were specially designed for pylon-race models. Their S-type shape leads to a pitching-moment coefficient near zero (as with a symmetrical profile) and, therefore, smaller tail forces are required to fly around the turn points. These airfoils aren't designed for low Reynolds Numbers. In practice, a Reynolds Number of at least 500,000 should be reached. To obtain the calculated performance with these profiles, a smooth surface is particularly important.

"The profiles E222 to E230 form a new flying-wing family that offers better performance with smaller Reynolds Numbers than the older family (E174 to E182). If the complete family is used in a flying-wing configuration, no twist is necessary, as long as the sweep is at least 1.5 times the chord for a rectangular wing. If the profiles beginning with E224 at the root are used, the sweep can be reduced to 1.1 times the chord. The slightly lower Reynolds Number sensitivity of this design has subsequently been confirmed in practice, although these profiles still require a Reynolds Number of at least 150,000. This is especially true of outboards, where the minimum Reynolds Number should not be smaller than this.

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QUIET FLIGHT

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"The E222 has polars and a zero-lift line similar to the profiles E211 and E212, which show very good performance in practice. Its pitching-moment coefficient is slightly smaller than theirs, and it has a value of -.097. On the one hand, this airfoil is suitable for thermalling with its maximum lift coefficient of 1.2; on the other hand, its drag is also less at lower lift coefficients, so it can be used for slope soaring and with motor gliders as well.

"Its lower camber and lower moment coefficient allow the E224 to be used more like an all-around profile, but because of its lower maximum lift coefficient, it's possibly more useful in slope soaring. The profile drag of this 10.7-percent-thick airfoil is still very small at zero lift. This tendency is carried over to the E226; this profile is almost symmetrical and therefore well suited to faster models of all kinds, except flying-wing configurations. Due to the small pitching-moment coefficient, relatively small horizontal tails are required to stabilize the model.

"Even more Reynolds-Number-sensitive is the E230, which can be used for unswept flying-wing models. One should try to obtain Reynolds Numbers of 200,000; these, of course, lead to very large chords.

"The E374 has shown good results for a long time, particularly in aerobatic sailplanes, and it can also be used to advantage in powered models. Its thickness of about 10.9 percent permits construction of relatively light wings with this profile.

"The E385 is very similar to the E174, so it's also well suited to thermalling, and it achieves low sink rates as long as the Reynolds Number is higher than 100,000. However, its performance at high speeds is only mediocre at best. The E387 has been designed for the smaller lift coefficients which occur in slope soaring. Nevertheless, it's also fairly well suited to thermalling, but, of course, it isn't as suitable as the E385. Wind-tunnel tests show that with this profile, too, a Reynolds Number of 100,000 should be provided. Its all-around characteristics (including thermal and slope soaring) make the E387 a very good choice.

"The E392 can be used in the same way as the E387. However, it's not as suitable for smaller models with wingspans of less than three meters, because its thickness of 10.2 percent requires large wing chords or higher flight speeds. This airfoil has been designed for the same purposes as the E387. However, due to its greater thickness, the performance is slightly worse at low angles of attack."

Wow! That's a lot of information about a lot of airfoils! However, I think that many "gray areas" about which airfoil to use for different applications are explained by this piece. The only thing I wish someone could tell me is how to achieve a specific Reynolds Number when designing a model!

Next month, I'll have a report on what was new at Toledo. Till next time—Good thermals and a full charge!

**Here are the addresses of the companies mentioned in this article:*

Futaba Corporation of America, 555 W. Victoria St., Compton, CA 90220.

Carl Goldberg Models, Inc., 4734 W. Chicago Ave., Chicago, IL 60651.

Astro Flight Inc., 13311 Beach Ave., Marina Del Rey, CA 90292.

Windsor Propeller Co., 384 Tesconi Ct., Santa Rosa, CA 95401. ■

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